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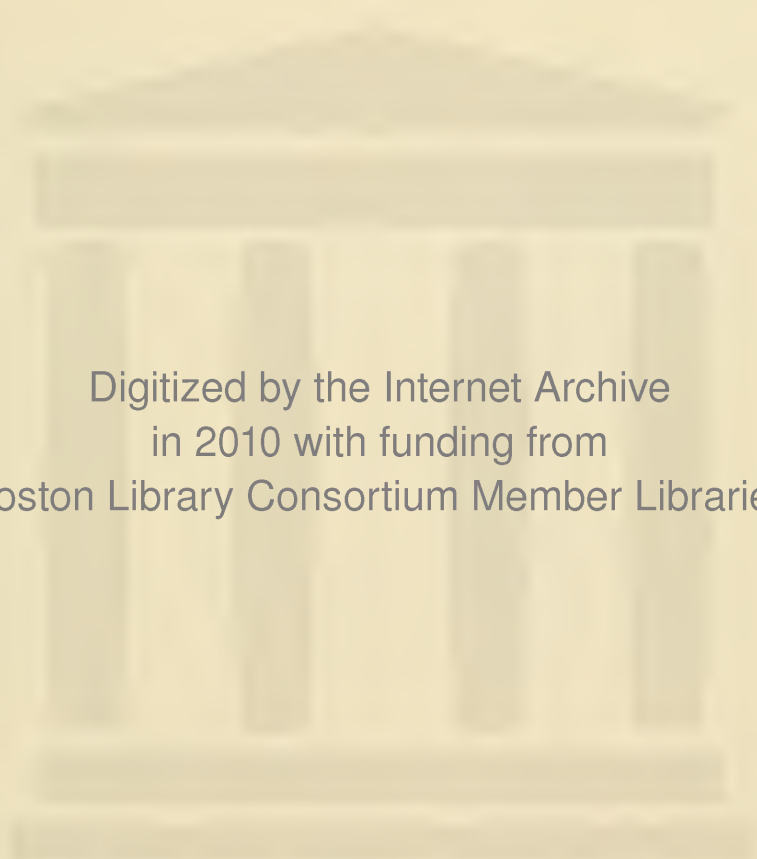
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MASSACHUSETTS

AMHERST, MASS.

UNIVERSITY OF MASSACHUSETTS BULLETIN

Summer Sessions 1970



The University reserves, for itself and its departments, the right to change its announcements or regulations whenever such action is deemed appropriate or necessary.

It is the policy of the University of Massachusetts that any and all acceptance of students for admission be without regard to race, color, or national origin.

VOLUME LXII

FEBRUARY 1970

NUMBER 1

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SUMMER SESSION 1970
UNIVERSITY OF MASSACHUSETTS
AT AMHERST



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TABLE OF CONTENTS

1970 SUMMER SESSION CALENDAR	5	SPECIAL PROGRAMS	11
Daily Schedule	5	STUDENT ACTIVITIES	13
THE UNIVERSITY	6	STUDENT PERSONNEL SERVICES	13
GENERAL INFORMATION	7	APPLICATION FORM	Centerfold
Application Procedure	7	DIRECTORY OF COURSES	17
Registration	7	Information for Course Selection	17
Housing	7	College of Agriculture	17
Board	7	College of Arts and Sciences	18
Expenses	7	School of Business Administration	27
Tuition and Fee Refunds	8	School of Education	29
Residence	8	School of Engineering	31
Veterans and War Orphans	8	School of Home Economics	32
Regulations	8	School of Nursing	33
Administrative Contacts	8	School of Physical Education	33
ACADEMIC INFORMATION	9	Department of Public Health	33
Adding or Dropping Courses	9	CAMPUS MAP	35
Overload of Credits	9		
Auditing	9		
Accelerated Enrollment	9		
Special Freshman Program	10		
Thesis and Problems Credit	10		
Withdrawals	10		
Credit for Summer Work	10		
GENERAL INFORMATION			

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SUMMER SESSION 1970 CALENDAR

MAIN SIX-WEEK TERM

Registration: July 13, Monday
Classes Begin: July 14, Tuesday
Final Day for Adding Courses:
July 17, Friday
Final Day for Dropping Courses
Without Penalty: July 27, Monday
Classes End: August 21, Friday

SPECIAL FRESHMAN PROGRAM

(See Page 10)

Registration: June 21, Sunday
Classes Begin: June 22, Monday
Final Day for Adding Courses:
June 30, Tuesday
Holiday, Friday, July 3
Final Day for Dropping Courses
Without Penalty: July 24, Friday
Classes End: August 28, Friday



Daily Schedule

80-Minute Period

A	7:45 am
B	9:15 am
C	10:45 am
D	1:00 pm
E	2:30 pm
F	4:00 pm

The letter code designates 80-minute class periods. All courses meet every day, Monday through Friday, unless otherwise specified. Courses which meet at special times are appropriately described. Special Freshman Program courses begin June 22 and end August 28, 1970.

Two numbers preceding a course title designate a course offered for both undergraduate and graduate credit.

Course credit is indicated in parentheses on the course title line. Where unspecified, credit is by arrangement.

Courses or labs which may be elected at more than one time are designated: A; B; C; etc. Courses meeting for longer than one period are described by hyphenating the first and last period during which the course meets, e.g., A-C; D-F; etc.

Special Sessions — Departments of Anthropology, Education, Engineering, English, Food Science, Home Economics, Nursing, Physics and Speech offer certain courses and programs at dates other than the main six-week term. These dates are given under the course description and/or under the section on Institutes and Special Programs.



Final examinations will be given during regular class time. At the option of the instructor, they may take two class periods.

GENERAL INFORMATION



THE UNIVERSITY OF MASSACHUSETTS Amherst • Boston • Worcester

Founded in 1863, the University of Massachusetts is one of sixty-six land grant colleges and universities in the United States providing public education, research, and service. The main University campus at Amherst, situated on 1,100 acres in the picturesque Connecticut River Valley, enrolls 18,000 students and is served by a \$150 million physical plant. The University has continually expanded to meet the growing needs of the Commonwealth. The University of Massachusetts at Boston, opened to 1,000 freshmen in 1965, currently enrolls approximately 3,500 students. The new University Medical School at Worcester is expected to open in the fall of 1970, and plans are presently being developed for the establishment of a Law School in Amherst.

At Amherst, a broad and continuous program is provided by the undergraduate schools and colleges, the Graduate School, and the Summer Session. Basic divisions

are the College of Agriculture, the College of Arts and Sciences, the Schools of Business Administration, Education, Engineering, Home Economics, Nursing, and Physical Education, and the Department of Public Health. The University also has voluntary Army and Air Force ROTC programs, an active Phi Beta Kappa chapter, and more than four hundred student organizations. Numerous centers and bureaus, engaged in specific projects and research, actively serve the Commonwealth in such fields as agriculture, computer science, education, government research, labor relations, natural resources, and population.

The University has joined Smith, Amherst, Hampshire and Mount Holyoke Colleges in a five college cooperative program, developing specific Ph.D. programs as well as operating a radio station and offering lectures, special courses, and inter-library loans.

GENERAL INFORMATION



Application Procedure

Pre-registration may be accomplished by submitting application and registration forms to Whitmore Administration Building for Undergraduates and to Graduate School, Munson Hall, for Graduate Students prior to June 10. Course registrations and schedules will be arranged for persons applying by this date. Applications received later than this date will not be processed, but returned to the student. In such cases no scheduling will be done in advance, no bill or housing assignment will be made until Registration Day, and the student may find certain courses closed because enrollments have been filled. Course registration and scheduling will be handled on a "first-come, first-served" basis. Although every effort is made to accommodate scheduling requests, the University cannot guarantee enrollment in a particular course section. Early application will help to ensure an applicant's securing his preferred schedule, and will enable him to proceed through registration in a minimum of time.

Students whose applications have been processed must still appear on Registration Day to obtain their schedules and to sign the Certificate of Registration Form. Applications for students who do not appear will be cancelled unless they register late.

Application forms are included in this bulletin and may also be obtained from the Registrar's Office, 213 Whitmore Administration Building, or from the Graduate School, Munson Hall, University of Massachusetts, Amherst, Massachusetts 01002.

Any student who holds a degree must apply through the Graduate School whether he is taking courses for credit or not, even though he is applying for undergraduate courses.

Acceptance to the University Summer Session is not an acceptance to the University for any regular session (other than for "Swingshift Freshmen.")

Registration

Registration for the main six-week term will be held in Boyden Gymnasium. Students may register from 9 a.m. to 12 m. and from 1:30 to 4:30 p.m. on July 13.

Registration for the Special Freshman Program will take place on Sunday afternoon, June 21, in the Southwest Complex at a time and place to be announced during Counselling Days.

Housing

It is the policy of the Board of Trustees to require undergraduates to be housed in University residence halls. Excepted from this policy are married students and students commuting from the home of their parents or spouse. University housing for the summer of 1970 is also optional for seniors and those over 21 years of age. Students may also be exempted for medical reasons.

Residence halls will open for occupancy at 1:00 p.m. on the day immediately preceding Registration Day (July 12), and will close on the day following the final day of classes. All resident undergraduate Summer Session students will be housed in the Southwest Residential College.

Room assignments will be available to pre-registered students upon arrival. Student rooms are usually designed for double occupancy; however, a few singles are available. All rooms are provided with basic furniture including beds and mattresses, desks, desk chairs, lounge chair, wastebaskets, bulletin boards, window drapes, night stands and study lamps. Each student is responsible for providing ashtrays (if desired), pillows, bed linen, blankets, and towels. Linen service is also available by contract through a private linen service.

Married students may obtain housing information by writing directly to the Off-Campus Housing Office, Room 236, Whitmore Administration Building. See the *Student Handbook* for residence hall regulations and procedures.

Board

The University Food Services will offer a 15-meal, Monday through Friday, meal ticket at a charge of \$3.20 per day or \$16.00 per week. All students in University residence halls are required to purchase this meal ticket except those students who are seniors, over 21 at the time of registration, or married. This board contract offers a highly selective menu with a "seconds" policy on all items.

The Student Union and two snack bars at Hampden and Worcester Commons are open for a la carte service throughout the week and weekend.

EXPENSES

In order to avoid delays at registration, students are encouraged to pre-register, by mail, by June 10 for the main six-week term of Summer Session. This will enable the

Cashier's Office to prepare a bill for each student, making it possible for the student to pay in advance. A STUDENT CANNOT REGISTER ON REGISTRATION DAY UNLESS HIS BILL IS PAID IN FULL.

TUITION

for residents of Massachusetts	\$10.00 per credit
TUITION	
for non-residents of Massachusetts	\$15.00 per credit
HEALTH FEE*	\$2.00 per week
STUDENT UNION FEE*	\$1.00 per week**
STUDENT ACTIVITIES FEE*	\$2.00 per week
RENT	\$14.00 per week**
BOARD — WEEKDAY ONLY	\$16.00 per five-day week

Swingshift Freshmen

TUITION for residents of Massachusetts	\$100.00
TUITION for non-residents of Massachusetts	\$300.00
(The matriculation fee payment of \$15.00 will be deducted from both tuition rates.)	
HEALTH FEE*	\$ 20.00
STUDENT UNION FEE*	\$ 10.00**
STUDENT ACTIVITIES FEE*	\$ 20.00
ATHLETICS (Physical Education)	
Non-veterans	\$ 10.00
RENT	\$141.00**
BOARD — WEEKDAY ONLY	\$160.00

Books, Stationery and Supply Expenses

Students should be prepared to pay for necessary books and incidental supplies. Certain departments make special charges for laboratory supplies.

Tuition and Fee Refunds

A student who leaves the University before a term is completed will ordinarily be granted a refund of tuition and fees according to the following schedule:

- During the first week of each term.60%
- During the second week of each term.20%
- After the second weekNo Refund

A student who makes an advance payment and then for any reason does not attend any part of that term will be given a full refund of tuition and fees. (Contact the appropriate Registrar's Office.)

A student involuntarily called into military service before the completion of a term will be given a pro rata refund of tuition and fees provided that he receives no academic credit for the work of that term. If academic credit is given, there will be no refund.

*Required fees to be paid by all students including commuters.

**Certain expenses, such as the Student Activities Fee and Rent, are in the process of being adjusted and may be higher than those listed in this catalog, which must be prepared for publication in the fall.

A student who is suspended or expelled from the University for disciplinary reasons forfeits all rights to a refund. No refund will be given of prepaid room rent after a term has begun and the room has been occupied.

Residence

New students who are residents of Massachusetts must file a Certificate of Residence with the Treasurer's Office in order to obtain a residential tuition rate. The application form includes the appropriate certificate.

Veterans and War Orphans

Students eligible for educational benefits through the Veterans Administration, either as veterans or as children of deceased or disabled veterans, should present certification of eligibility at registration. If already receiving benefits, they should enroll again for them. Students are invited to consult the Placement and Financial Aid Office, Whitmore Administration Building, which acts as a clearing center for matters pertaining to the Veterans Administration.

Regulations

Student Handbooks will be distributed at registration. The Handbook contains many helpful details on the various student services, academic procedures and policies, and also includes the "Code of Student Conduct," "Judiciary System," and "Judicial Act." All students are responsible for the contents.

Normal University regulations will apply during the Summer Session, unless otherwise specified.

Motor Vehicle Regulations — Driving to and from classes is not permitted; only students in the following categories will be authorized to possess and operate a motor vehicle in the Amherst area:

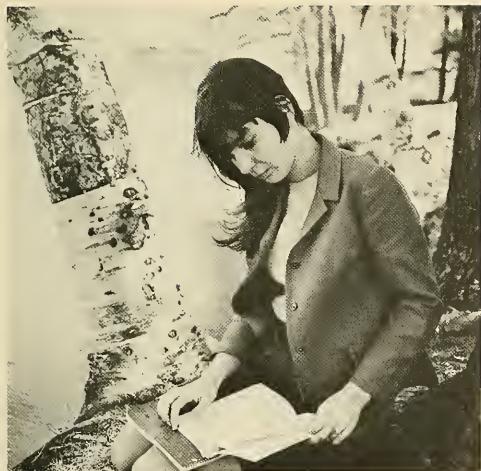
- Commuting students who live more than one mile from the center of campus.
- Students whose locomotive ability is so seriously impaired that they would be unable to meet regular class appointments without motor vehicle assistance.
- Married students residing with their spouse.
- Members of the senior class.

Students who seek an exception to these rules must present their appeal to the appropriate (i.e., undergraduate or graduate) Student Personnel Office.

Administrative Contacts

The usual initial contact for students with the administrative staff is based upon a student's local residence — residence hall students should begin with their Area Coordinators; men and women commuters with the Dean of Men or Dean of Women.

ACADEMIC INFORMATION



Adding or Dropping Courses

Main Six-week Term:

A student may add or drop any course during the first four class days of the term without notation on his record. No course may be added after the fourth day. After the fourth day but before the eleventh day, a course may be dropped and a mark of W (withdrawn) recorded. After the tenth day, any course dropped is recorded as WF (withdrew failing). This grade is computed in the quality point average.

Exceptions to this rule are made in certain cases of protracted illness or serious personal or social problems. In such cases, a WP (withdrew passing) may be recorded if the student obtains the following: (1) the favorable recommendation of the appropriate University Health or Student Personnel officer; (2) the approval of his adviser and the Dean of his school (for visiting students only, approval of the Director of the Summer Session is substituted for that of the adviser and Dean); (3) certification from his instructor that he was passing the course at the time he first contacted the appropriate student personnel officer regarding his problem. Forms for the above may be obtained at the Registrar's Office by undergraduates. Forms for graduate students may be obtained at the Graduate Office. An overload of courses is not considered sufficient grounds for dropping a course under this arrangement.

GENERAL INFORMATION

Special Freshman Program:

A student enrolled in the Special Freshman Program may drop any course during the first seven days of the term without notation on his record. No class may be added after the seventh day. After the seventh day and through July 24 (mid-term date), a course may be dropped without penalty and a W (withdrawn) recorded. After this date, any course dropped is recorded as a WF (withdrew failing) and is computed in the quality point average. Exceptions to this rule are made in certain cases of protracted illness or serious personal or social problems. In such cases a WP (withdrew passing) may be recorded. The forms required for the above may be obtained in the Registrar's Office.

Overload of Credits

A full summer session program is usually considered to consist of two three-credit courses. Students who wish to register for additional credits must secure approval as follows:

1. 9 credits (one extra course):
Academic Dean (University students)
Director of Summer Session (visiting students)
2. A Senior graduating in Summer or the following January may register for 9 credits without extra permission.

Forms for overloads for undergraduate students may be secured in the Registrar's Office, 213 Whitmore. Graduate students should inquire at the Graduate Office, Munson Hall.

Auditing

A student who intends to audit a course must register and pay the regular tuition and activities fees. There is no special audit fee. A student who drops a course during the term, but wishes to continue on an audit basis, will receive a grade in accordance with regulations governing the Add and Drop periods.

Accelerated Enrollment

The University invites superior high school students to begin their college education immediately upon graduation by enrolling in the Summer Session. For the highly motivated student who, perhaps, is already convinced that his formal education will require graduate or professional studies, an early start may conserve valuable time. Similarly, students in financial need may find it less expensive to complete their undergraduate education in less than four academic years. Summer Session attendance can substantially reduce the time necessary to obtain a bachelor's degree.

University of Massachusetts students who wish to start their undergraduate work in the summer are advised to apply to the Admissions Office for regular admission by the fall of their senior year. Their applications must be re-

ceived and complete no later than March 1. At the same time they should indicate their desire for summer study. The Registrar's Office will forward a Summer Session application and detailed information regarding the summer program.

Students who have been accepted at institutions other than the University of Massachusetts may enroll in the summer providing they secure the approval of their college. A space for this approval is furnished on the Summer Session application.

Special Freshman Program

Each year a number of high school graduates are admitted to the University with the stipulation that they begin their college careers in the Summer Session, take their vacation period during the fall semester, and join their regular class for the spring semester. After completion of this first year, students then follow the regular school year sequence.

This is an invitational program for students who apply for regular admission to the University and is not available to visiting students. Begun in the summer of 1964 with 180 students, the program has been expanded significantly in recent years and will accommodate 300 students this summer. In order to avoid, wherever possible, conflicts with high school commencement and senior class activities, the summer session for students enrolled in this program will commence June 21, 1970 and extend for 10 weeks through August 28, 1970.

Students will normally complete 12 credits in addition to one semester (1 credit) of required physical education and one semester (1 credit) of elective ROTC work. While course offerings will be limited (approximately 25 courses from 17 departments), there will be sufficient breadth to ensure most people a balanced program. Although this summer term parallels the work of a semester, many students enroll in one or two courses in the fall semester in their home area to ensure that they have enough credits to equal a full semester.

The academic program is composed entirely of special courses for these students and consists of lower division courses. Ordinarily a student will select four courses from the offerings of the following departments which would include English or Speech plus Physical Education and ROTC (Air Force or Army), if elected. The departments offering courses are:

Art	History
Botany	Mathematics
Chemistry	Philosophy
Engineering	Psychology
English	Sociology
French	Spanish
Geology	Speech
German	Zoology
Government	

Thesis and Problems Credit

Graduate students contemplating special course work and thesis work during the Summer Session should seek the permission of their department heads and/or advisers, and obtain approval from the Dean of the Graduate School. Special and Thesis courses are listed by number in the departmental offerings section of the bulletin. A student who fails to register for such work will not receive an ID card, and cannot use University facilities.

Withdrawals

An undergraduate student who has attended Summer Session classes and who desires to drop all his courses and thus terminate enrollment must observe formal procedures. Summer Session withdrawal papers originate in the office of the Dean of Men or Women for commuting students, and in the office of the Southwest Area Coordinator for on-campus residents. If a student withdraws from the Summer Session during the second half of the term (after July 31), grades of WF or WP will be entered, as appropriate, for all courses.

Summer Session withdrawal papers for graduate students may be obtained at the Graduate Office, Munson Hall.



Credit for Summer Work

All courses carry degree credit and are equivalent in method, content, and credit to courses offered at the University during the regular academic year. Credits obtained in these courses are ordinarily accepted as transfer credits by other colleges and universities.

Students who are registering for the first time or who have registered previously and desire to pursue an advanced degree at the University must secure the approval of the requisite departments and the approval of the Dean of the Graduate School on the appropriate application form.

SPECIAL PROGRAMS



French Studies at Pau

The program in Pau, southwest France, provides study in French language, stylistics, literature and civilization. Courses are taught by French university professors, mainly from the Faculties of Bordeaux and Toulouse. Open to both undergraduates and graduate students the program permits students to study in courses appropriate to their language ability and interests. Up to six University of Massachusetts credits in French can be earned. The total program is from June 18 to August 30, the study program from July 8 to August 20, permitting independent or group travel before and after the study program. An integral part of the program is excursions to Lourdes, the Basque country, and other places of cultural interest. The Participation Fee is \$700, and covers international travel, tuition, room and board at Pau, and excursions planned as part of the program. A limited number of partial scholarships are available. Contact: Dr. Seymour Weiner, Department of Romance Languages, Herter Hall, University of Massachusetts, Amherst, Massachusetts 01002.

GENERAL INFORMATION

Hispanic Studies in Madrid

In its 1970 program in Madrid, June 18 to August 20, the Spanish section of the Department of Romance Languages offers two graduate seminars, two courses open to graduates, 1971 seniors and, by permission, to approved students of the class of 1972, and one undergraduate course. They are all conducted in Spanish and carry 3 credits each. The normal load is 6 credits. The purpose of the program is: 1) to provide access (for qualified students) to intensive advanced work in literature and the history of ideas; 2) to offer the experience of total immersion in the Spanish language and culture; 3) to introduce students to Spanish scholars and creative intellectuals and artists who have not come to the U.S. to teach. Among the distinguished faculty for 1970: Pedro Lain Entralgo, Jose Monleon, Jose Luis Alonso-Misol, and Jose Olovio Jimenez.

In addition to a six-week course of study, the program offers lectures, integrated weekend trips, and an optional post study tour of Andalucia. Fees include round-trip air transportation, tuition, room and board in a selected private home, (June 19 to August 3), lectures and excursions optional trip costs approximately \$100.). The cost to Massachusetts students is \$875; to non-residents, \$905.

For further information write to: Director, Madrid Program, Herter Hall, University of Massachusetts, Amherst, Massachusetts 01002.

Oxford Program

A special group of courses in English Literature is regularly offered at Trinity College, Oxford, during July and part of August. The six-week session corresponds with the regular session of the campus of the University of Massachusetts and awards University of Massachusetts credit. The courses are all taught by Oxford dons (current or past) and the Bodleian Library is available for extensive research. Graduate and undergraduate courses are offered and vary each year according to the availability of specialists at Oxford and the interests of students. Special evening lectures by noted authorities supplement these course offerings. Overall cost to the student is \$850.00. Contact: Prof. Ernest Hofer, Department of English, Bartlett Hall, University of Massachusetts, Amherst, Massachusetts 01002.

Study in Bologna

The University sponsors a program of summer study in Bologna, Italy. The program begins in mid-June and ends in the last week of August. The program is staffed primarily by members of the faculty of the University. The curriculum consists of regularly scheduled University courses on subjects in which the Italian location contributes significantly to the student's understanding and experience. Field trips to major cultural centers in Italy are an integral

part of the program. Any student in good academic standing at his college or university is eligible to enroll. He will be expected to take two of any of the three-credit courses in the field of Art, History, Italian, Government and Music. Cost to the student will be approximately \$875. Enrollment is limited. Contact: Prof. Howard Quint, Department of History, Herter Hall, University of Massachusetts, Amherst, Massachusetts 01002.

Journalistic Studies Program

An intensive three-week course in Journalistic Studies — JS 280 and 580, The Communication Process — will be held during the first three weeks of the Summer Session. Offered in cooperation with the New England Society of Newspaper Editors, this course is designed primarily for working newspaper men and women who attend the University on fellowships provided by their newspapers. The course is open to other students with permission of the instructor.

The 3-credit course meets daily from 9:15 to noon and from 3:30 to 4:30 in the afternoon, with the afternoon seminars being conducted by visiting speakers provided by the New England Society of Newspaper Editors. The speakers include distinguished editors, publishers, newspaper attorneys, and reporters in New England journalism.

For further information, write: Dr. Arthur Musgrave, Professor of English and Journalistic Studies, Machmer Hall, University of Massachusetts, Amherst, Massachusetts 01002.

Program ABLE (Accelerated Business Leadership Education)

Program ABLE, offered by the School of Business Administration, is designed to develop and enhance managerial skill among members of minority groups in our society. Persons who are presently employed in business and possess an undergraduate degree are eligible for enrollment.

The program leads to the Master of Business Administration degree. An initial Summer Session consists of an intensive sequence of instruction in the disciplines underlying graduate business education. Following successful completion of the summer work, students are admitted to the regular M.B.A. program of the School of Business Administration.

The entire program may be completed in 15 months — one academic year and two summer sessions. Each student is sponsored and supported by his company for the duration of his residence in the program.

For further information write to: Dean Lawrence Johnson, School of Business Administration, University of Massachusetts, Amherst, Massachusetts 01002.



Summer Arts Program

Each year a Summer Arts Program is presented by the University of Massachusetts, providing the University community with a varied and balanced presentation of the arts. A film series provides at least one film a week. Prominent musical artists and lecturers are engaged throughout the summer. Both national travelling art exhibits and exhibits of local artists are shown. The Summer Repertory Theater presents plays of professional quality each season. Summer students are admitted free of charge to all Summer Arts Program events upon presentation of their Summer Arts Ticket. Details of the Summer Arts Program events and ticket information will be available at registration or Student Activities Office or at the Office of the Fine Arts Council.



STUDENT ACTIVITIES

The Student Activities Office in the Campus Center is the headquarters for the Recognized Student Organizations (R.S.O.) and the Program Office. It provides a banking, bookkeeping and auditing service for student organizations, as well as resource material and counsel on program planning, budgeting, purchasing, contracting, and most other aspects of the affairs of student organizations.

Participation in extra-curricular activities offers opportunities to further the broader objectives of a college experience. The knowledge, skill and judgment developed in the class room can be tested and refined through use in the organizational setting.

Summer Student Government offers a forum for debate on matters of importance to the University community. For those interested in communications a summer student newspaper is published twice weekly. An intramural program including softball and basketball offers an opportunity for competitive participation. The Four-College Folk Dance Club will offer international folk dancing weekly throughout the summer. Additionally, the members of each residence hall may plan and present a varied program of activities.

Such activities can be a profitable means of fostering general enrichment to those who wish to take advantage of all that the University can offer.

The following staff personnel may be contacted for any service or assistance needed:

Gerald Scanlon, Assistant Dean of Students

Sheila McRevey, Program Adviser

James Riley, Program Adviser

Armand H. Demers, Supervisor of R.S.O. Accounts

STUDENT PERSONNEL SERVICES

Student Personnel Services comprise the administrative agencies with primary concern and responsibility for students and student services outside the classroom. These offices are directed by the Dean of Students.

THE DEAN OF STUDENTS directs and supervises the activities of all Student Personnel Service Offices, as follows:

THE ASSOCIATE DEAN is responsible for the administration of all residence halls and the activities program of all men and women undergraduates. The Associate Dean's Office includes in its staff grouping the Housing Office, the Area Coordinators and all Heads of Residence, the Coordinator of Student Activities, and the Campus Center-Student Union Manager.

AREA COORDINATORS administer the residence areas, and are on the staff of the Associate Dean of Students. All residence hall staff personnel report to the respective Area Coordinator.

Area Coordinators plan and direct all student personnel administrative functions for residence halls within a given residential area; supervise and counsel the professional staff and student assistants in the residence halls, advise elected officers and committee chairmen in residence halls, provide individual and group counseling, and perform related work as required or as may be assigned by the Associate Dean of Students. Heads of Residence are responsible to the Area Coordinator.

THE DEAN OF MEN develops programs and is responsible for administrative liaison with fraternities and fraternity residents, men commuters and other activities relating to men undergraduates as may be directed by the Dean of Students.

THE DEAN OF WOMEN develops programs and is responsible for administrative liaison with sororities and sorority residents, women commuters and other activities relating to women undergraduates as may be directed by the Dean of Students.

THE HOUSING OFFICE has responsibility for the assignment of all University-operated housing facilities, and serves as a central source of information for off-campus housing listings.

THE COORDINATOR OF STUDENT ACTIVITIES administers and coordinates student activities including the Student Activities Office, which is the headquarters for Recognized Student Organizations (R.S.O.), the Program Office and the Summer Fine Arts Program.

THE ADMISSIONS OFFICE is responsible for all administrative procedures with respect to undergraduate admissions to the University including liaison with high school guidance counselors, community college staff personnel and other admissions officers for transfer students. It passes on the readmission of returning students and reentering students, and sets admissions standards in coordination with the Provost and academic departments. The admissions deans serve as advisers to various academic year classes.

THE REGISTRAR'S OFFICE is responsible for registration (enrollment) and matriculation of undergraduate students at the University, administrative procedures relating to course loads (adding and dropping courses), section changes, course of study, withdrawals, producing grade reports, transcripts, and maintaining the permanent academic record cards. The Graduate School Registrar's Office handles the same functions for the graduate students.

THE COUNSELING CENTER'S basic aim is to support the student's efforts to develop into a mature, useful,

self-fulfilled member of society. The student who understands himself is better able to resolve problems and make decisions consistent with his needs and life goals. The Center's day-to-day work with the student-client involves psychological counseling on personal, social, educational, and vocational problems.

Most of the students who visit the Counseling Center have normal concerns and are not emotionally disturbed. Many come to talk over transient adjustment problems, or personal difficulties that they do not wish to share with friends, parents, or instructors. Many seek help with decision-making in vocational and educational matters. Most are dealing with problems of daily living that are a part of college life.

All individual counseling contacts with members of the Counseling Center staff are strictly confidential. No information is released to members of the University community, to parents, or to outside agencies (such as graduate schools, law enforcement agencies, or draft boards) without the student's explicit authorization, in advance.

When the need arises, the Counseling Center staff also administers psychological tests for assessing students' abilities, interests, and personalities. Such tests are interpreted to students as part of the counseling process.

APPOINTMENTS — Students seeking an appointment are seen immediately through an intake process.

SUMMER COUNSELING — A specific office is established each summer to direct the counseling and orientation of students and parents. During a three day period, students familiarize themselves with the campus and are pre-registered for the fall.

ACADEMIC ADVISING — A student is either assigned to a faculty adviser in his department or has his choice of electing advisory services from a centralized advisory service in his school or college. A student ordinarily will see his adviser when he has questions about selection of courses, school or departmental requirements, change of major, or other problems that are primarily of an academic nature. Each student is also free to go to his department head or school dean to discuss similar questions. The counseling staff works closely with deans and advisers on individual student problems and consults with faculty and deans on general advising problems. The Counseling Center staff also works with individual students on special advisement problems.

THE PLACEMENT AND FINANCIAL AID SERVICES provide advice vocational and financial counseling. The Office also aids students in finding suitable employment; awards loans, grants, and scholarships; assigns part-time work; coordinates veterans' affairs; acts as a source of information concerning military service, and maintains a library of career and occupational literature.

SENIOR PLACEMENT — The office gives special attention to providing seniors with job-placement assistance and career information. Throughout the year, the office schedules student interviews on campus with employers from business, industry, education, government, etc.

Cumulative student personnel records, including prepared credentials, personal resumes and recommendations are provided. With guidance, the aim is to enable seniors and registered graduates to attain their career objectives.

FINANCIAL AID — All information relative to financial aid should be sought through the Placement and Financial Aid Office. Many types of financial assistance, including loans, grants, and specific and general scholarship are available. Part-time employment and work-study programs are handled through this office.

MILITARY SERVICE — The Office of Placement and Financial Aid Services also provides information concerning draft status and military reserve duty. Students who reach the draft age (18) may register through this office, which notifies the local draft board. Information concerning the status of individual students is transmitted to the local draft boards, when requested by the student.

VETERAN BENEFITS — All benefits for veterans attending the University are arranged through the Office of Placement and Financial Aid Services, working in coordination with the Veterans Administration.

THE UNIVERSITY HEALTH SERVICES provide guidance for the development of optimum physical, emotional, and social welfare in the University community. Most of its resources are directed toward providing health care for students. It has an active concern for matters of environmental health and safety affecting the welfare of the students, faculty, employees, and visitors.

The center of activities is the Infirmary. Here are located an out-patient department, with supporting X-ray, laboratory, and physical therapy facilities, and eighty beds for the care of students who need hospitalization.

Recognition of the specific emotional needs of students in an educational environment has led to the provision of an active mental health program including diagnostic and limited treatment services. Orthopedic services can be arranged as the need arises. Hospitalization for conditions requiring more specialized care than is available in the Infirmary can be arranged at the Cooley Dickinson Hospital in Northampton.

Any care rendered on the campus by members of the staff of the Health Services is provided without additional charge to those who have paid the student health fee. The provision for care off-campus can be arranged by the Health Services, but the cost of this care is the responsibility of the student. The Health Services work closely with the School of Physical Education in adapting the facilities of the School to the individual needs of students for

restricted or remedial activity. The health status of participants in the athletic program, both intra-mural and intercollegiate, is under Health Services supervision, and care is always available for any injuries resulting from these activities.

Students are urged to consult a member of the Health Services staff as soon as any indication of a physical or emotional disorder is evident. It is much easier for the staff, and less time-consuming for the student, to rectify a minor difficulty before it has become a source of disability. Students who are under medical supervision prior to entrance are urged to have their physicians write the Health Services, giving reports and instructions in appropriate detail. In brief, the Health Services attempts to provide all students with a coordinated and comprehensive program of health supervision formerly provided by their family physicians.

All visits and information gained as a result of visits to the Health Services are treated as confidential and no such information will be released without the express permission of the student.



SUMMARY OF REGISTRATION PROCEDURES

Pre-registration — Regular Session (Swingshift students will be notified of acceptance and registration procedures by mail.)

1. Review and select courses from Summer School Catalog.

GENERAL INFORMATION

2. Complete Summer School Registration Application forms. (Residency, if applicable.) Graduate students complete Special Registration form also.
3. Mail form to Registrar's Office (Undergraduate, 213 Whitmore Administration Building or Graduate School, Munson Hall). Deadline — June 10.
4. Pay tuition and fee bill upon mail request.
5. Confirm registration on July 13 at Boyden Gymnasium.
6. Course changes received prior to June 10 will be processed. If received later, they must be taken care of on Registration Day.
7. Housing assignments mailed directly to pre-registered applicants.
8. Dining Hall tickets — see Dining Hall Representative at Boyden Gymnasium on Registration Day; or see representative at the Central Food Service Office, Worcester Dining Commons, after Registration Day.
9. All tuition and fee bills must be paid before attending classes.

Late Registration — July 13

(At Boyden Gymnasium, or at Registrar's Office after this date.)

1. Review and select courses from Summer Session Catalog.
2. Complete application forms.
3. Have courses approved by department representatives.
4. Pay tuition and fee bills — Cashier's Office.
5. Deliver data processing cards to departments.
6. Complete Housing arrangements with Housing Representative at Boyden Gym on Registration Day; or at Housing Office, 232 Whitmore Administration Building, after Registration Day.
7. Complete dining arrangements, if desired, with Representative at Boyden Gym; or after this date, at Worcester Dining Commons.

Course Changes

(At Boyden Gymnasium on Registration Day or at Registrar's Office or Graduate School after Registration Day.)

1. Review and select courses from Summer Session Catalog.
2. Complete course add-drop form.
3. Secure departmental approval and have Registrar's Office review.
4. Pay bill at Cashier's Office — if necessary.
5. Deliver data processing cards to departments.
6. See page 9 for add/drop rules.



DIRECTORY OF COURSES

Information for Course Selection

The following course descriptions include all information needed to select a schedule of courses. Building and room assignments will be available at registration.

Numbers preceding the course titles conform to the following outline:

- 000-099 Non-credit courses, non-quality point courses, entrance deficiencies
 - 100-199 Undergraduate credit only — Lower Division
 - 200-399 Undergraduate credit only — Upper Division
 - 399 Honors Work
 - 400-499 Professional courses which presume a bachelor's degree
 - 500-699 Graduate credit only; courses corresponding to 200-399 series
 - 700-999 Graduate level courses
- Two numbers preceding a course title designate a

course offered for both undergraduate and graduate credit. The student must sign for *either* graduate or undergraduate credit — *not both*.

Course credit is indicated in parentheses on the course title line. Where unspecified, credit is by arrangement. In cases of specifically arranged hours, the student must indicate the number of credits to be earned.

A letter code designates the 80-minute class periods. All courses meet every day, Monday through Friday, unless otherwise specified. Courses which meet at special times are appropriately described. Special Freshman Program courses begin June 22 and end August 28, 1970.

Note special dates for some courses.

Courses or labs which may be elected at more than one time are designated:

A; B; C; etc. Courses meeting for longer than one period are described by hyphenating the first and last period during which the course meets, e.g., A-C; D-F, etc.

COLLEGE OF AGRICULTURE

AGRICULTURAL ENGINEERING

- S-18. FOOD SERVICE FACILITIES PLANNING II (4)
B
Problems of planning and equipping commercial food service facilities. Designs and floor plans for efficient operation and use of space; equipment selection, utility requirements and related engineering principles.

ENTOMOLOGY

- 126. GENERAL ENTOMOLOGY (3)
C-D-E, M, W, F
A brief survey of the entire field of entomology; structure, development, evolution, classification, biology, and natural control of insects. Formation of an insect collection is optional.
- 279, 579. ANIMAL ECOLOGY (3)
B, M, W, F; Lab, D-E, TU, TH
Relations of animals to their physical and biotic environment, with observations and quantitative measurement of these factors and responses in the field and laboratory. Prerequisite, a course in entomology or zoology. 2 class hours, 1 2-hour laboratory period.

FORESTRY AND WILDLIFE MANAGEMENT

- Forestry
121. TIMBER HARVESTING (3)
June 1-19
Timber harvesting and primary conversion of wood products; field trip of one-week duration to observe these processes in major wood-using industries. 3 40-hour weeks.
- 222, 522. CONSERVATION OF NATURAL RESOURCES (3)
D, M, TU, TH, F; Lab, D-F, W
Conservation principles and their application to problems in soils, water, forests, wildlife, mineral and general landscape resources; relationship of conservation to national development.
- 225. THE ELEMENTS OF FOREST MENSURATION (3)
June 1-19
The measurement of trees, stands, and forest products; field-office practice in timber estimating and log scaling; collection and compilation of forest inventory data. 2 class hours. 1 4-hour laboratory period. 3 40-hour weeks.

HOTEL AND RESTAURANT ADMINISTRATION

- 100. INTRODUCTORY (3)
A
An introductory course in restaurant and hotel operations. The development of the industry, current trends, and an analysis of the various types of operations that make up the industry.
- 101. FOOD SERVICE MANAGEMENT (3)
A
A study of practices used by the food service industry pertaining to purchasing, receiving, and issuing food, beverages, and other supplies. Principles of food and beverage cost control.
- PLANT AND SOIL SCIENCES
- 700. SPECIAL PROBLEMS (3)
Hours by arrangement
Selected research problems not related to a candidate's thesis.
- 702. RESEARCH LITERATURE (3)
Hours by arrangement
A critical review of the scientific literature in an area of specialization.

800. MASTER'S THESIS (10)
Hours by arrangement
900. DOCTORAL DISSERTATION (30)
Hours by arrangement

COLLEGE OF ARTS AND SCIENCES

ANTHROPOLOGY

102. INTRODUCTION TO
ARCHAEOLOGY (3)
B

An introduction to the history, methods and theory of archaeology with an outline of the main characteristics of the prehistoric record throughout the world.

103. INTRODUCTION TO PHYSICAL
ANTHROPOLOGY (3)
A

This course will deal with human evolution, human variation, racial classifications, racism, and modern theories of variation.

104. INTRODUCTION TO CULTURAL
ANTHROPOLOGY (3)
D

An introduction to social and cultural Anthropology dealing with variations among societies in technology and economics, social and political organization, art, religion, and ideology.

371. HUMAN EVOLUTION (3)
C

A consideration of the mechanisms of evolutionary change, the fossil and archaeological evidence bearing on man's evolution, and an evaluation of the various interpretations of the evidence. Prerequisite, Anthropology 103.

- 377, 677 SUMMER FIELD SCHOOL IN
"ARCHAEOLOGY (6)

This course is designed to give the student practical experience and training in archaeology. Both prehistoric and colonial sites will be excavated, and instruction will be given in archaeological methods and techniques. Prerequisite, Anthropology 360 or equivalent. June 8 - Aug. 1., New Mexico.

- 395, 695. FIELD COURSE IN CULTURAL
ANTHROPOLOGY (6)

A summer field course affording the advanced student supervised training in cultural anthropological research. Location

this year is St. Vincent. Prerequisites, advanced work in anthropology and permission of the instructor. June 8 - Aug. 1.

ART

- *100. BASIC DRAWING (3)
B-C; D-E

Drawing in black and white, applying pencil, crayon, charcoal techniques to representation in line and tone, emphasizing sound observation and effective presentation.

- *115. INTRODUCTION TO ART (3)
A

An introduction to great works of art studied in historical sequence, including techniques and aesthetic principles.

- *120. BASIC DESIGN I (3)
B-C; D-E

Two-dimensional design concepts arising out of work with specific problems in a variety of media.

- *122. BASIC DESIGN II (3)
B-C

Continuation of Art 120. Specific three-dimensional problems stressing the interrelationship of materials, processes, techniques, and sculptural concepts. Prerequisite, Art 120.

- 220, 520. PAINTING I (3)
A-B; D-E

Easel painting in oil and related media, based on elementary understanding of physical properties of medium, and encouraging individual directions within limitations of sound composition. Prerequisites, Art 100, 120.

- 222, 522. PAINTING II (3)
A-B; D-E

Initial concentration on transparent water color, emphasizing control of techniques and mastery of color relationships. Further experience with opaque water color, such as gouache, casein. Prerequisites, Art 100, 120.

- *224, 524. PAINTING III (3)
A-B; D-E

Continuation of Art 220.

- *242, 542. PRINTMAKING:
INTAGLIO I (3)
D-E

Basic study of materials, techniques, and aesthetic considerations peculiar to etching, engraving, and aquatint. Students

print their own work. Prerequisites, Art 100, 120.

- *340, 640. PRINTMAKING:
INTAGLIO II (3)
D-E

Advanced study of materials, techniques, and aesthetic considerations peculiar to etching, engraving, and aquatint. Prerequisite, Intaglio I.

- *244, 544. PRINTMAKING:
LITHOGRAPHY I (3)
A-B

Basic study of materials, techniques, and aesthetic considerations peculiar to lithography. Students print their own work. Prerequisites, Art 100, 120.

- *287. MODERN ART, 1880 TO THE
PRESENT (3)
C

Emphasis on major artists such as late Cezanne and Gauguin, Picasso, Matisse, Klee, Jackson Pollock, Optical and Pop artists. Main developments of style will be considered in relation to these artists.

- *385. SPECIAL PROBLEMS (3)
Hours by arrangement

For qualified senior art majors who wish to specialize further in a particular aspect of art. Arrangements must be made with members of the department.

- *701. SPECIAL PROBLEMS:
PAINTING (3)
Hours by arrangement

- *702. SPECIAL PROBLEMS:
PRINTMAKING (3)
Hours by arrangement

- *705. SPECIAL PROBLEMS:
DRAWING (3)
Hours by arrangement

- *706. SPECIAL PROBLEMS:
ART HISTORY (1-3)
Hours by arrangement

*All Art courses have limited enrollment. We suggest that another course be listed on the Application Form and marked, "alternate." You will be pre-registered for the alternate course only if the Art course is overenrolled. The designation of an alternate course will not prejudice consideration of your request for the Art course.

ASTRONOMY

See Physics and Astronomy

CERTIFICATE OF DOMICILE AND RESIDENCE

RESIDENCE REQUIREMENTS FOR MASSACHUSETTS TUITION RATES

As a state institution, University of Massachusetts offers the privilege of in-state tuition to all students entering from the Commonwealth. Eligibility for admission under the low residential rate is determined in accordance with the following policy established by the University.

1. A student must present evidence satisfactory to the Treasurer of the University that his domicile is in the Commonwealth of Massachusetts in order to be considered eligible to register in the University as a resident student. He must also have established a bona fide residence in the Commonwealth for a period of not less than one continuous year prior to the date of acceptance at the University, and certify his intention to continue to maintain such a residence.
2. The domicile and residence of a minor shall follow that of the parents unless such minor has been emancipated. In case of emancipation, the student in addition to the requirements of these regulations respecting domicile and residence shall present satisfactory proof respecting emancipation. Minors under guardianship shall be required to present in addition to the certification of domicile and residence satisfactory documentary evidence of the appointment of the guardian.
3. No student shall be considered to have gained residence by reason of his attendance in the University nor shall a student lose residential preference during his continuous attendance at the University unless he ceases to be a citizen of the Commonwealth.
4. The domicile and residence of a wife shall follow that of the husband.
5. This form of certification for classification as to domicile and residence status must be submitted by each student. Misrepresentation of facts in order to evade the payment of out-of-state tuition shall be considered sufficient cause for suspension or permanent exclusion from the University.
6. Discretion to adjust individual cases within the spirit of these rules is lodged with the President of the University.

Note: The certificate on the reverse side is required only for new applicants to the University.

STATEMENT OF PARENT OR GUARDIAN:

(If student is under 21 years old)

I,, certify that I am the legal parent () guardian* () of, and that he (she) is domiciled in the Commonwealth of Massachusetts and has maintained a bona fide legal residence herein for a period of not less than one continuous year prior to the date of acceptance at the University; further, that he (she) intends to continue to maintain such a residence.

Signature.....

STATEMENT OF STUDENT IF 21 YEARS OR OLDER:

I,, certify that I am 21 years or older and that I am domiciled in the Commonwealth of Massachusetts and have maintained a bona fide legal residence herein for a period of not less than one continuous year prior to the date of acceptance at the University; further, that I intend to continue to maintain such a residence.

Signature.....

*If certification is that of guardian, copy of Court appointment must be submitted.

STATEMENT OF TOWN OR CITY CLERK:

This is to certify that the records of the City (Town) of indicate that is a legal resident of Massachusetts

Signed.....

Title

Date

(Seal)

NOTE: REGULARLY ENROLLED UNIVERSITY OF MASSACHUSETTS STUDENTS (BOTH AMHERST AND BOSTON) WHO HAVE A CERTIFICATE OF RESIDENCE ON FILE DO NOT HAVE TO SUBMIT THIS FORM.

REGISTRATION APPLICATION SUMMER SESSION 1970 AMHERST CAMPUS

SPECIAL NOTE — Admission to the Summer Session in no way implies admission to a regularly scheduled semester (fall or spring) of the University.

PLEASE PRINT:

Name _____ Last _____ First _____ Initial _____
Home No. & Street _____ Home Phone _____
City & State _____ Zip Code _____
Country of Citizenship _____
Summer Billing Address, if different _____ Zip Code _____

EDUCATIONAL RECORD:

Secondary School _____

Colleges Attended _____

degree _____ dates _____

REGULAR UNIVERSITY STUDENTS:

--	--	--	--	--	--	--	--

Student Number

Class or Graduate _____

Please check appropriate boxes

- ☐ Undergrad ☐ Graduate
☐ Male ☐ Female
☐ Single ☐ Married
☐ Reside in Mass. ☐ Out of State ☐ Foreign

Major Dept _____

Date of Birth _____

RESIDENCE PLANS — Check one

- ☐ Commuting from home of parent or spouse
☐ Plan to live in Residence Hall Roommate choices _____
☐ Plan to live off-campus (see regulations — undergraduates must be over 20 or seniors)

BOARD PLANS — check one

- ☐ Plan to dine on campus
☐ Off-campus dining plans (see regulations)

FOR OFFICE USE ONLY

No Credits _____
Tuition _____
Rent ☐ _____
Board ☐ _____
Activities _____
S.U. _____
Health _____
Athl. Fee _____
Total _____

Dorm Code ☐

TENTATIVE PROGRAM OF COURSES

Dept.	Number	Title	Starting Date	Crs.
Special Sessions				
Meeting Period				
Main 6-Week Term				

SUMMER SESSION INFORMATION

Please read and fill in carefully. Please Print

NAME _____ STUDENT NUMBER _____
Last First Initial

HOME ADDRESS _____
Street City State Zip Code

SEX ☐ F ☐ M AGE _____ INSTITUTION FROM WHICH DEGREE IS EXPECTED _____ MAJOR (UG) OR DEPT. (GRAD) _____ CREDIT HOURS TAKEN THIS SUMMER _____

PLEASE CHECK THE APPROPRIATE BOX IN EACH SECTION

GRADUATE STUDENTS ONLY		UNDERGRADUATES ONLY		GRADUATES AND UNDERGRADUATES	
Master's Degree _____ Doctoral Degree _____ Other _____		Year of Study (as of Sept.) _____ Freshman _____ Sophomore _____ Junior _____ Senior _____ Swingshift _____ Non-matriculating _____		Check as many as are applicable Accelerating to graduate early _____ Making up course(s) failed _____ Making up deficient credit hours _____ Working for advanced degree only summers _____ Writing Thesis _____ In Special Summer Institute _____ Title and Code _____ Nothing else to do _____ Other _____	
Year _____ 1st Year _____ 2nd Year _____ 3rd Year _____ Other _____					

APPLICATION SUMMER SESSION 1970

UNIVERSITY OF MASSACHUSETTS AT AMHERST

Completed applications should be
returned as follows:

- For undergraduate work —
Registrar's Office
213 Whitmore Administration Building
University of Massachusetts
Amherst, Massachusetts 01002
(Telephone: 545-0555)
- For graduate work —
Graduate School Office
Munson Hall
University of Massachusetts
Amherst, Massachusetts 01002
(Telephone: 545-0024)

BOTANY

175. GENETICS IN EVOLUTION (3) B

Survey of the cell and those fundamental genetic principles which are the basis of evolution. Origin and history of organic evolution. Mechanisms of evolution. For non-science majors only. Prerequisite, Botany 100 or 101, or Microbiology 150, or Zoology 101.

211, 511. INTRODUCTORY PLANT PHYSIOLOGY (4) D; Lab, E-F, M, W, F

Plant processes and their relation to the complex of activity constituting plant growth. Topics include water relations, photosynthesis, fat and protein synthesis, digestion, translocation and respiration. Prerequisites, Botany 100 or Botany 101, and at least one semester of Organic Chemistry.

385. SPECIAL PROBLEMS (1-3) Hours by arrangement

Supervised problem work for qualified students.

700. SPECIAL PROBLEMS (1-5) Hours by arrangement

Research not expected to terminate in a thesis; advanced study in special subjects.

800. MASTER'S THESIS (10) Hours by arrangement

900. DOCTORAL DISSERTATION Hours by arrangement

CHEMISTRY

111. GENERAL CHEMISTRY (3) B; Lab, D-E, Tu, Th

A study of the fundamental chemical laws and theories, with the object of giving the student a sound scientific training through a course in chemistry. For engineers and other students planning to take advanced courses in chemistry.

112. GENERAL CHEMISTRY (3) B; Lab, D-E, Tu, Th

A continuation of Chemistry 111.

127. ANALYTICAL CHEMISTRY (4) D-E-F

A broad look at the principles of analytical chemistry, for students not majoring in chemistry. Basic laboratory techniques and operations of quantitative analysis. Prerequisite, Chemistry 112 or 114.

160. ORGANIC CHEMISTRY (4) B; Lab, D-E-F, M, W, F

A course for students whose major department does not require a year course in organic chemistry. Prerequisite, Chemistry 102 or 112.

246, 546. THEORETICAL INORGANIC CHEMISTRY (3) C

A survey of theoretical aspects of inorganic chemistry chosen from such topics as electron structure and its relation to periodic properties, chemical bonding, molecular structure, coordination chemistry, acid-base theory, non-aqueous systems, and reaction mechanism. Prerequisite, Chemistry 285.

262. ORGANIC CHEMISTRY FOR NON-MAJORS (3) C

Introduction to the chemistry of carbon compounds. Survey of the principal classes of organic compounds and their reactions with emphasis on the relation between structure and reactivity. Prerequisite, Chemistry 112 or 114. Concurrent enrollment in Chemistry 167, 168 or 263, 264 is required.

264. ORGANIC LAB FOR NON-MAJORS (1) D-E-F, Tu, Th, F

Application of the experimental techniques of organic chemistry to the preparation, purification and analysis of organic compounds. Prerequisite, concurrent enrollment in Chemistry 165, 166 or 261, 262.

800. MASTER'S THESIS (10) Hours by arrangement

900. DOCTORAL DISSERTATION (30) Hours by arrangement

COMPARATIVE LITERATURE

201. MODERN EUROPEAN LITERATURE I (3) A

Currents in modern European drama and fiction, mirrored in the thematic and stylistic evolution of the theatre from Chekhov to Beckett and Genet, and in philosophical fiction concerned with re-evaluation of traditional values and the search for meaning through the modes of art and action.

203. THE EUROPEAN NOVEL: MAN AND SOCIETY (3) B

A study, in English translation of twelve sixteenth to nineteenth century European

novels in the context of societies they reflect, describe, and transcend.

251. CHINESE LITERARY GENRES: POETRY AND MYSTICISM (3) C

A critical reading of Chinese poetry and philosophical materials. Emphasis on Chinese mystical literature together with paradigms chosen from Western poetry and mystical literature. Readings, in English translation, will include the *I Ching* (Book of Changes), the *Tao Te Ching* (the Way and its Power), and works of Chinese Taoist poet, Chuang-tzu, as well as selections from the poetry of Blake and Yeats and the writings of St. John of the Cross and St. Teresa.

ECONOMICS

125. ELEMENTS OF ECONOMICS (3) A; B; C; D

An introduction to basic principles which govern the behavior of the American Economy, with emphasis on the macro-economic issues of full employment, price stability and economic growth.

126. PROBLEMS OF THE NATIONAL ECONOMY (3) A; B; C

Introductory analysis of resource allocation and income distribution in the American Economy. Problems of international trade, underdeveloped nations, and the Soviet Economy.

201. INTERMEDIATE MICRO-ECONOMIC THEORY (3) A

Microeconomic analysis of consumers, firms, industries, and markets; rational decision-making, under conditions of certainty; balancing forces in a free enterprise economy.

214. MACROECONOMIC THEORY AND BUSINESS CYCLES (3) B

Formulation and empirical testing of static and dynamic theories of aggregate income, employment, and prices with special reference to the business cycle, growth, and economic forecasting.

232. THE STRUCTURE OF AMERICAN INDUSTRY (3) C

Business enterprise, market competition, and economic development in American industries. The social effectiveness of

industries analyzed through measures of industrial structure and market performance.

241. LABOR PROBLEMS (3) A

Background of the labor movement and problems involved in the management-labor relationship and the efforts of management, unions and government to solve them.

266. ECONOMIC DEVELOPMENT (3) D

Economic problems of underdeveloped countries and the policies necessary to induce growth. Individual projects will be required.

701. MICROECONOMIC THEORY (3) B

A systematic development of the theory of the consumer, the firm, the industry, and their interactions. Prerequisite, Economics 201.

705. MACROECONOMIC THEORY (3) C

Nature, construction and use of social accounting systems. A systematic development of static and dynamic theories of aggregative economic behavior and their applications. Prerequisites, Economics 212 or 214 or equivalent.

ENGLISH

125. MASTERPIECES OF WESTERN LITERATURE (3) B, C, D

A study of selected masterpieces, from Homer and the Bible to James Joyce or Robert Frost. The course aims to enrich the student's appreciation of literary values and develop his understanding of abiding human issues. Prerequisite, English 112 or 113. English 125 or 127 is prerequisite to English 126 or 128. These courses may be chosen as fulfillments of the sophomore literature requirement. They are prerequisite to elective courses in the Department, except that an elective course may be taken concurrently with English 126 or 128. For prospective English majors this elective should be English 201.

126. MASTERPIECES OF WESTERN LITERATURE (3) B, C, D

A continuation of 125.

201. MAJOR BRITISH WRITERS (C) (3) A

Study of a selection of leading British writ-

ers from Chaucer to Dryden (but excluding Shakespeare); to follow at least the first semester of the sophomore literature requirement; required of English majors.

216. CHAUCER (3) A

The major works, especially *Troilus* and selected *Canterbury Tales*, as combinations of medieval art and thought with pre-Renaissance motifs and Chaucer's genius for realism.

221. SHAKESPEARE (3) B

Examination of Shakespeare's dramatic art and leading ideas through a careful study of approximately a dozen plays.

225. THE RENAISSANCE IN ENGLAND (3) D

The non-dramatic literature of Tudor and Jacobean England in terms of emergent forms and literary ideas. Special attention to More, Spenser, Bacon, and Thomas Browne.

236. MILTON (3) C

Development of the mind and art of Milton as a figure of the English Reformation and the late Renaissance, with emphasis on *Paradise Lost*.

252. THE ROMANTIC POETS (3) B

A further study of the Romantic Movement, with particular attention to Byron, Shelley, and Keats.

253. THE ENGLISH NOVEL FROM SCOTT THROUGH HARDY (3) D

The reading and discussion of significant representative novels, including works of such authors as Dickens, Thackeray, the Brontës, Eliot, and Hardy.

262. THE MODERN NOVEL: 1930-1960 (3) C

An analytical presentation of some twelve novels. A continuation of English 261 but may be elected independently; no English major may, however, elect both English 261 and English 262.

263. MODERN BRITISH AND AMERICAN DRAMA (3) B

A study of representative dramatists since the late nineteenth century, including

Shaw, O'Casey, O'Neill, Williams, and others. Emphasis on changing trends in twentieth-century dramatic art.

267. CONTEMPORARY POETRY (3) D

Poetry in English since 1945.

275. MAJOR AMERICAN WRITERS (3) A

Emerson, Hawthorne, James, and any of the following by announcement: Howells, Adams, Dos Passos, Lewis, Anderson, Fitzgerald, Hemingway.

276. MAJOR AMERICAN WRITERS (3) A

Thoreau, Melville, Whitman, and any of the following by announcement: Cooper, Poe, Dickinson, Twain, Crane, Dreiser, Faulkner, Wolfe.

321. STRUCTURE OF MODERN ENGLISH (3) C

Introduction to applied English linguistics; sounds, forms, and word-order of modern Standard American English; modern grammatical theory.

391. SEMINAR (3) Hours by arrangement

Section No. 1. Poetry and Critical Thought of T.S. Eliot; Section No. 2. Life Patterns.

703. MIDDLE ENGLISH (3) B

A study of the language and of documents representing the chief dialects.

708. CHAUCER (3) B

Chaucer's *Canterbury Tales* and the critical problems implicit in his works.

721. THE DEVELOPMENT OF THE ENGLISH NOVEL (3) C

Readings in the English novel to the late 19th Century, from Richardson to Conrad, with special attention to some ten representative novels.

732. SHAKESPEARE (3) D

Close examination of Shakespearian plays representing the characteristic of his dramatic art.

737. LITERATURE OF THE 17TH CENTURY (3) D

Readings in 17th Century prose and poetry

from Donne to Marvell; analysis of the more significant areas of thought and style.

755. AMERICAN REALISM (3)
C

The development of American realism from 1865 to 1914, stressing Twain, Henry James, Howells, and Henry Adams.

770. CONTEMPORARY DRAMA (3)
D

Representative English, Irish, and American dramas since the 1890's stressing major trends from realism to the theatre of the absurd.

771. CONTEMPORARY FICTION (3)
A

Representative British and American novelists, emphasizing major trends, from Conrad to the present.

772. CONTEMPORARY POETRY (3)
A

The chief recent poets in English and their immediate forerunners, with brief attention to distinctive new voices and trends.

774. LITERARY CRITICISM (3)
C

A study of critical theory and practice with chief emphasis on the major philosophical critics beginning with Plato and Aristotle.

810. SEMINAR: SCOTTISH LITERATURE (3)
Hours by arrangement

811. SEMINAR: MILTON'S LYRIC (3)
Hours by arrangement

812. SEMINAR: WORDSWORTH (3)
Hours by arrangement

819. SEMINAR: FOLKLORE (3)
Hours by arrangement

830. SEMINAR: FROST AND ROBINSON (3)
Hours by arrangement

JOURNALISTIC STUDIES

280, 580. THE COMMUNICATION PROCESS (3)
June 15-July 3
M, T, W, Th, F, 9:15 - 12 m.;
3:30 - 4:30 p.m.

A study of the way the communication process has been organized in our society through mass communication media. Prerequisite, permission of instructor.

GEOLOGY AND GEOGRAPHY

Geology

101. PHYSICAL GEOLOGY (3)
A; Labs, E-F, M, W; E-F, Tu, Th;
E-F, Tu, Th

The nature and origin of the landscape features of the earth, and their underlying rocks and structures, including the work of rivers, waves and currents, wind, and glaciers; and the role of earthquakes, volcanoes, and the processes of mountain-building.

Geography

135. FUNDAMENTALS OF GEOGRAPHY (3)
B

An examination of the fundamental physical and human pattern of the earth's surface employing the fundamental geographic concepts of region spacial association and spacial interaction.

260. ECONOMIC GEOGRAPHY (3)
A

The distribution, production and utilization of the natural resources and commodities on which man's livelihood depends and the problems which they pose.

385. SPECIAL PROBLEMS — SOUTHEAST ASIA (3)
A

Examination of the fundamental physical, cultural and human aspects contributing to regional uniformity. Special attention will be given to case studies and contemporary conditions since 1945.

GERMANIC LANGUAGES AND LITERATURES

110. ELEMENTARY GERMAN (3)
B

Conversation, reading, grammar and composition.

120. ELEMENTARY GERMAN (3)
D

A continuation of German 110.

130. INTERMEDIATE GERMAN (3)
B

Reading, conversation, composition. Grammar review. Prerequisite, German 120.

140. INTERMEDIATE GERMAN (3)
B

A continuation of German 130.

251. THE GERMAN NOVELLA (3)
C

A study of the novella form and its development, centering on representative works of major writers in the 19th century (e.g., C.F. Meyer, Keller, Storm). Prerequisite, German 140 or equivalent. Open to freshmen who have fulfilled the language proficiency requirement.

268. GERMAN MASTERPIECES IN TRANSLATION II: MODERN GERMAN LITERATURE (3)
C

An introduction for the non-German major to the masterpieces of modern German literature. Not open for major credit in German.

409. GRADUATE READING COURSE (3)
E

Designed for graduate students preparing for their M.A. or Ph.D. reading examination. No previous knowledge of German required. No credit.

730. LITERATURE OF THE FIFTEENTH AND SIXTEENTH CENTURIES (3)
E

Humanism and Reformation.

777. BIBLIOGRAPHY AND METHODOLOGY (2)
B

An introduction to tools and methods of research. Required of all candidates for graduate degrees.

786. SPECIAL TOPICS IN THE LITERATURE OF THE TWENTIETH CENTURY (3)
C

GOVERNMENT

100. AMERICAN GOVERNMENT (3)
B, D

Political institutions and processes, as illustrated by the American governmental system.

150. EUROPEAN GOVERNMENTS (3)
B, E

A survey of the politics and governmental institutions of Great Britain, France, Germany, and Soviet Russia.

201, 501. ANCIENT & MEDIEVAL POLITICAL THOUGHT (3)
B

The development of political thought and its relation to cultural and institutional growth from the time of the Greeks to the end of the Middle Ages.

- 203, 503. PROBLEMS IN POLITICAL THOUGHT (3)
C

An analysis of central concepts and themes in political theory. Attention is given to major orientations on both classical and contemporary thought.

- 218, 518. POLITICAL PARTIES AND ELECTIONS (3)
E

The American political process, with emphasis on parties, pressure groups, and public opinion.

- 220, 520. MUNICIPAL GOVERNMENT (D) (3)
C

A survey of the governmental structure and function of American municipalities.

- 236, 536. GOVERNMENT AND POLITICS OF RUSSIA (3)
D

Organization and functioning of the Communist party; the administrative process; terror as a system of power; Soviet foreign policy, its formation and execution. Prerequisite, Government 150 or 160-161 or History 100-101 or consent of instructor.

- 242, 542. THE POLITICS OF SUB-SAHARAN AFRICA (3)
A

The organization and processes of African politics, centering on the general political problems facing contemporary African governments. Prerequisite, permission of instructor.

HISTORY

100. HISTORY OF WESTERN THOUGHT AND INSTITUTIONS (3)
A

The historical development of the western European countries, their ideas, and institutions.

150. THE DEVELOPMENT OF AMERICAN CIVILIZATION (3)
C

A survey of the American national growth.

151. THE DEVELOPMENT OF AMERICAN CIVILIZATION (3)
B

A continuation of History 150.

203. THE LATTER MIDDLE AGES 1100-1350 (3)
D

Revival of towns and commerce; the growth and development of the feudal monarchies and ecclesiastical authority; rise of secularism.

205. THE AGE OF THE RENAISSANCE AND REFORMATION, 1300-1600 (3)
B

A study of the changes in European thought and institutions during the development of Humanism and the Protestant and Catholic Reformations.

212. EUROPEAN INTELLECTUAL HISTORY IN THE NINETEENTH CENTURY (3)
D

Chief intellectual currents in Europe; romanticism, liberalism, religious revival, socialism, Darwinism, racism, and mass culture.

215. THE HISTORY OF RUSSIA 1815-PRESENT (3)
C

Political, economic, social and intellectual development of Russia. Tsarist era; origins of Russian Marxism and the Soviet period.

319. JACKSONIAN AMERICA (3)
D

Political, economic, and social developments in the period before the Civil War.

324. THE PROGRESSIVE AGE, 1900-1920 (3)
C

The political response to the changing economic and social conditions in American life.

701. EUROPEAN HISTORIOGRAPHY TO THE ENLIGHTENMENT (3)
F

Critical evaluation of the techniques and ideas of major historians and influential schools of historical interpretation from the Greeks through the Renaissance.

703. AMERICAN HISTORIOGRAPHY (3)
A

Interpretations of major themes as developed in the works of leading historians. The first course will treat the period through the Civil War.

705. PHILOSOPHY OF HISTORY (3)
F

The "philosophy of history" both as epistemology and as a method of explanation, and a comparison of the aims of history and the sciences. The course involves an analysis of the nature of history: the differ-

ence between truth and fact, the possibility of objectivity, and the theory of historical explanation. Major historians in the field are read, from Thucydides and Augustine to Croce and Toynbee.

712. TOPICS IN THE AGE OF THE RENAISSANCE AND REFORMATION (3)
C

European culture between 1400 and 1600. A reading knowledge of a modern European language is generally required.

735. TOPICS IN THE TWENTIETH CENTURY (3)
C

The nature of Progressivism, American involvement in World Wars I and II, the character of recent American politics, and cultural and economic changes since the turn of the century.

LINGUISTICS

- 201, 501. GENERAL LINGUISTICS (3)
E

A comprehensive treatment of the field of linguistics. The nature of the language. Some language universals. Phonology, syntax, and other aspects of modern language theory. By permission may be counted for major credit in English, German, Romance Languages, Speech, and Psychology.

MATHEMATICS AND STATISTICS

Mathematics

100. MATHEMATICS IN THE MODERN WORLD (3)
B

A cultural and historical presentation of some mathematical ideas to demonstrate both the scientific and the humanistic value of the subject.

IMPORTANT

Limited enrollment. Suggest that another course be listed on the application form and marked, "alternate." You will be pre-registered for the alternate course only if Math 100 is overenrolled. The designation of an alternate course will not prejudice your request for Math 100.

110. ELEMENTARY TECHNIQUES OF MATHEMATICS (3)
A, B, C

Some basic techniques including sets, logic, numbers, counting, probability, functions, and graphs. A student cannot receive credit for this course and either of the courses 111 or 112.

123. ANALYTIC GEOMETRY AND CALCULUS I (3) A, B, C	211. INTRODUCTION TO MODERN ALGEBRA I (3) A	Reading, listening, score study. Besides music of Haydn, Mozart, and Beethoven, that of their contemporaries may also be included.
Logic, sets, topics from algebra, introduction to analytic geometry, functions, limits and derivatives, differentiation of algebraic functions, tangent and normal lines. Trigonometry is not prerequisite to this course.	Introduction to semigroups, groups, rings, fields and modules. Prerequisite, Mathematics 200.	700. SPECIAL PROBLEMS Hours by arrangement. (1-6)
124. ANALYTIC GEOMETRY AND CALCULUS II (3) A	325. INTRODUCTORY MODERN ANALYSIS I (3) B	701. SEMINAR IN MUSICOLOGY (3) A
Applications of the derivative, conic sections and other algebraic curves, the definite integral and some of its applications, differentiation of transcendental functions. Prerequisites, Math 123 and trigonometry.	Basic topology of Euclidean n-space. Convergence of sequences and sequences of functions. Continuous functions; local and global properties.	Materials and methods of systematic and historical musicology. Specialized topics will be investigated. The application to different problems of various subjects such as acoustics, aesthetics, and analysis. May be repeated for credit with varying contents as advised.
151. BASIC CONCEPTS OF ALGEBRA (3) B	700. TOPICS COURSE (1-3) Hours by arrangement	713. ANALYSIS OF MUSIC LITERATURE, 1600-1750 (3) B
The real numbers as a field. Linear and quadratic equations and inequalities. Systems of linear equations and inequalities. Congruence. Complex numbers. Polynomials. Algebraic structures. Functions. Highly recommended for prospective elementary school teachers. Prerequisite, Mathematics 111.	Topics may be chosen from the fields of algebra, geometry, theory of functions, topology, and applied mathematics. Prerequisite, permission of instructor.	Representative compositions from the Baroque period. Analysis by score and sound of the various musical forms and media.
173. ANALYTIC GEOMETRY AND CALCULUS III (3) C	Statistics 121. ELEMENTARY STATISTICS (3) C	741. SUPERVISION AND ADMINISTRATION (3) B
Techniques of integration, further applications of calculus, basic properties of continuous and differentiable functions, parametric equations, polar coordinates, infinite series. Prerequisite, Mathematics 124.	Nature of statistics; description of data; sample distribution; statistical theories and dispersion procedures; regression and correlation, time series. Not open to students who have completed Statistics 315, Psychology 241 or 245, or Sociology 247.	The function of the music supervisor and administrative problems in public school.
174. ANALYTIC GEOMETRY AND CALCULUS IV (3) A	126. STATISTICS FOR S.B.A. (3) A, B	742. RESEARCH IN MUSIC EDUCATION (3) C
Solid analytic geometry, partial differentiation, multiple integrals with applications, introduction to differential equations. Prerequisite, Mathematics 173.	Nature of statistics; description of data; sample distribution; statistical theories and dispersion procedures; regression and correlation, time series. For S.B.A. majors.	Individual research projects in selected areas of Music Education.
200. FUNDAMENTAL CONCEPTS OF MATHEMATICS (3) C	MUSIC 101. MUSIC APPRECIATION (3) B	PHILOSOPHY 105. INTRODUCTION TO PHILOSOPHY (3) B
Non-axiomatic propositional calculus (with truth tables), basic quantification theory and set algebra. Binary relations, equivalence relations, partitions, functions. Development of the basic algebraic and topological features of the real numbers from the axioms for a complete ordered field. Complex numbers regarded as ordered pairs of real numbers. Prerequisite, permission of instructor.	Open to all students not majoring in music. Previous musical training is not required. Basic music materials, principles of design, and cultural significance of representative works from the Ninth Century to the present are studied and discussed.	An introduction to some of the most important of the general questions, ideas, theories, and methods of inquiry which have given direction to Western thought.
	215, 515. COUNTERPOINT (3) A	110. ETHICS (3) C
	The study of the techniques of 16th Century modal counterpoint. Analysis, listening, and written assignments. Prerequisite, Music 114.	An examination of classical and contemporary theories concerning policy formation and the justification of personal decisions and ways of life.
	301, 601. MUSIC HISTORY — HAYDN, MOZART, BEETHOVEN (3) C	125. INTRODUCTION TO LOGIC (3) C
		An inquiry into the nature of critical thinking, including the functions of language, the structure of deductive arguments, and a glimpse at inductive methods.
		161. HISTORY OF PHILOSOPHY — ANCIENT AND MEDIEVAL (3) B

The development of Western thought from its earliest beginnings to the flowering of medieval scholasticism. Emphasis on the contribution of important movements and great thinkers.

162. HISTORY OF PHILOSOPHY — MODERN D (3)

Continuation of Philosophy 161 from the Renaissance and the rise of modern science to 19th century idealism, positivism and voluntarism.

241, 541. PHILOSOPHY OF RELIGION (3) E

Readings in contrasting religious philosophies followed by analysis of concepts involved in understanding religion as coherently related to the other aspects of experience.

261, 561. CONTEMPORARY ANALYTIC PHILOSOPHY F (3)

Russell, Carnap, Wisdom, the later Wittgenstein, Austin, Strawson, Quine. Prerequisite, one semester course in philosophy.

280, 580. ETHICAL THEORY F (3)

A discussion of some of the major problems of ethical theory with special emphasis on definition, the status of ethical statements, reasoning and justification in ethics.

700. RESEARCH AND READING IN PHILOSOPHY (3-6) Hours by arrangement

Independent graduate research on specific topics in philosophy under the supervision of a faculty member. Prerequisite, permission of department.

800. MASTER'S THESIS (6-10) Hours by arrangement

900. DOCTORAL DISSERTATION (30) Hours by arrangement

PHYSICS AND ASTRONOMY

Astronomy

101. ELEMENTARY ASTRONOMY (3) B; Labs M, p.m.; Tu, p.m.; W, p.m.; Th, p.m.

Astronomy 101 is designed primarily for students not majoring in the physical sciences. Historical perspective. The solar system, systems of coordinates, laws of motion, planets and satellites, the sun. Cosmogony and current theories on the

origin of life. Supplemented by occasional hours of evening observation.

Physics

141. INTRODUCTORY PHYSICS I, II (4) B-C, M, Th

Mechanics, sound, heat; electricity, magnetism, light and modern physics, using trigonometry and algebra, but not calculus. Intended for pre-medical, pre-dental, pre-veterinary, and some science major students.

161. GENERAL PHYSICS I (4) B-C, Tu, F

Mechanics. For students primarily interested in engineering, chemistry, or mathematics. Prerequisite, Mathematics 135 previously, or concurrently with special permission.

162. GENERAL PHYSICS II (4) C, Tu, F; Lab, D-E, Tu

Heat, electricity, and magnetism. Prerequisites, Mathematics 135; Physics 161; Mathematics 136 previously or concurrently.

319, 619. ELECTRONICS INSTRUMENTATION (3) D-E, M, W, F

A laboratory-oriented course designed expressly for physicists and chemists. Basic electronics principles, servo systems, operational amplifiers, digital circuits, other modern devices. Prerequisite, permission of instructor.

700. INDEPENDENT STUDY (1-6) Hours by arrangement

Special study in some branch of physics, either theoretical or experimental, under the direction of a faculty member. A written proposal must be submitted to the faculty member guiding the investigation and to the Head of the Department for approval before registration.

707. CLASSICAL ELECTRODYNAMICS (II) (3) B

The field of a moving charge, the Lienard-Wiechert potentials, Lorentz transformation and special relativity, covariant formulation of Maxwell's equations. Radiation of electromagnetic waves; the near field and far field, radiation damping and self fields, spectral resolution of radiation. Magnetohydrodynamics and plasma physics, collisions, scattering and absorption. Prerequisite, Physics 706.

900. DOCTORAL DISSERTATION (30) Hours by arrangement

PSYCHOLOGY

101. ELEMENTARY PSYCHOLOGY B (3)

An introduction to the basic approaches and concepts of modern psychology. Examples are drawn from the areas of perception, conditioning, cognitive processes, social behavior, tests and measurements, and personality. Typically oriented discussion sections emphasize the heuristic value of these concepts and approaches in considering some of the problems of our society.

141. PSYCHOLOGICAL METHODS (3) B

Introduction to the ways questions about behavior are formulated and then tested through experiments. Lectures and laboratory experiences involving concepts from many areas of psychology are used to expose psychology majors to the procedures utilized in designing, conducting, and reporting experiments. Prerequisite, Psychology 101.

145. STATISTICS IN PSYCHOLOGY A (3)

Introduction to statistical principles and techniques as applied to psychological data.

210, 510. SENSATION AND PERCEPTION D (3)

Methods, data and theories of the functioning of various sensory systems. Topics will include a survey of basic sensory processes in the cutaneous senses, audition, vision, gustation, and olfaction; and higher perceptual processes in selected senses. Prerequisite, Psychology 101.

220, 520. LEARNING AND THINKING (3) C

A general survey of animal and human learning and performance. Topics include: factors affecting acquisition, generalization, discrimination, extinction, and transfer in animals and humans; memory; and higher cognitive processes in humans. Prerequisites, Psychology 101.

250, 550. PHYSIOLOGICAL PSYCHOLOGY B (3)

Neural bases of behavior, current issues in physiological psychology; psychobiological investigations of learning, sensory processes, motivation, and instinctive be-

havior. Prerequisites, Psychology 101 and Zoology 101 or consent of instructor.

262, 562. CHILD PSYCHOLOGY (3)
D

Psychological development of the child, including language, emotions, intelligence, social behavior, motivation, and personality. Not open to psychology majors. Prerequisite, Psychology 101.

263, 563. PSYCHOLOGY OF ADOLESCENCE (3)
A

Consideration of the development, and emotional, social and intellectual adjustment of the individual during the adolescent years. Prerequisite, Psychology 101.

290, 590. INDUSTRIAL PSYCHOLOGY (3)
B

Psychological principles, underlying personnel selection and training, communication and decision-making in industry. Prerequisite, Psychology 101.

301, 601. EDUCATIONAL PSYCHOLOGY (3)
B

Psychological facts and principles of development, learning, and measurement as applied to educational situations. Prerequisite, Psychology 101.

305, 605. HISTORICAL AND CONTEMPORARY SYSTEMS (3)
D

General structure of psychological theory; analysis and comparison of historical systems in the tradition of British empiricism-associationism and Continental rationalism, and of derivative near-contemporary and contemporary mentalistic, functionalistic, and behavioristic systems. Prerequisite, Psychology 101.

Courses Open to Graduate Students Only
700. PROBLEMS IN PSYCHOLOGY (3)
Hours by arrangement

A research project which may be taken in lieu of the master's thesis, or by doctoral students as minor research.

800. MASTER'S THESIS (Max., 6)
Hours by arrangement

871, 872. PRACTICUM (3)
Hours by arrangement

Practice in the application of psychological techniques to clinical, and counseling, and practice in teaching in any area of psychology.

873. TEACHING PRACTICUM IN PSYCHOLOGY (3-12)
Hours by arrangement

Required of all doctoral candidates. Experience in procedures, leading discussion groups and teaching labs. Close supervision by members of the faculty. Students will meet once a week to discuss problems in teaching.

891, a, b, c, d, e SEMINAR (2)
Hours by arrangement

Selected topics of current significance in psychology. Research studies will be analyzed and theoretical advances explored. Prerequisite, permission of instructor.

895. RESEARCH METHODOLOGY (2)
Hours by arrangement

Study and evaluation of research methods and of problems in the major fields of psychology.

900. DOCTORAL DISSERTATION (Max., 6)
Hours by arrangement

ROMANCE LANGUAGES

French

110. ELEMENTARY FRENCH (3)
A; Labs 4 periods
Hours by arrangement

For students who have had no previous creditable training in French. Intensive practice in the four language skills.

130. INTERMEDIATE FRENCH (3)
B

Intensive review and study. Readings in modern French literature. Prerequisite, French 120 or equivalent.

133. INTERMEDIATE FRENCH (3)
(REINFORCED)
B, M-F and C, M and W

Same as French 130 but meeting 7 times per week. For students who need extra help.

140. INTERMEDIATE FRENCH; FRENCH LIFE AND CULTURE (3)
C

An introduction to French culture through selections from 20th century literature. The course emphasizes reading and discussion.

320, 620. THE FRENCH RENAISSANCE (3)
A

Major writers of the 16th Century with appropriate attention to important humanistic and artistic developments.

330, 630. FRENCH LITERATURE OF THE 17th CENTURY: THEATER (3)
B

355, 655. THE FRENCH NOVEL OF THE 19th CENTURY (3)
C

Development of the novel since the Revolution.

409. GRADUATE READING COURSE (0)
B

Designed for graduate students preparing for their M.A. or Ph.D. reading examination. No previous knowledge of French required.

Italian

126. INTENSIVE ELEMENTARY ITALIAN (6)
A, C

For highly motivated students with no previous knowledge of Italian regardless of the success or failure in other language courses. All four skills are stressed. At the end of the semester, students with average language aptitude can expect to obtain the degree of competence in the language which the linguistically gifted student demonstrates after one year of the traditional four-semester sequence.

Spanish

110. ELEMENTARY SPANISH (3)
B; Lab C; A; Lab B

For students with no previous creditable training in Spanish. Intensive practice in language skills. To fulfill the language requirement, upon completion of the course most students are required to continue by taking Spanish 130 or 140.

120. ELEMENTARY SPANISH (3)
B; Lab D

130. INTERMEDIATE SPANISH (3)
B

For upperclassmen who have completed Spanish 110-120, and those freshmen and transfer students who are found qualified by placement examination. Training in language skills, with emphasis on speaking and understanding; readings in cultural and literary texts. Students completing Spanish 140 fulfill the language requirement.

140. INTERMEDIATE SPANISH (3)
C

182. ORAL SPANISH (3)
A

Oral aspects of the language; pronunciation, vocabulary building, speeches, discussions, debates. Grammatical elements required for correct and fluent use of American and Peninsular Spanish. Prerequisite, Spanish 140 or permission of the department.

262. RECURRENT THEMES IN
SPANISH LITERATURE (C) (3)
C

Selected complete works in various periods read critically and historically to develop salient characteristics of a given problem, theme or figure as reflected in work of different authors, genres, movements, and centuries. Emphasis on training the student for independent work through writing of research reports and final paper. Prerequisite, Spanish 161.

315, 615. SPANISH LITERATURE TO
1700 (3)
A

Spanish literature in the Middle Ages and Renaissance; introduction to the High Golden Age. Required of all undergraduate Spanish majors prior to the senior year. Prerequisite, Spanish 262.

381, 681. DRAMA AND POETRY IN
TWENTIETH-CENTURY
SPAIN (3)
B

Spanish poetry and the theater from the Generation of '98 to the present.

409. GRADUATE READING COURSE (0)

Reading for Graduate students preparing their M.A. or Ph.D. reading exam. Prerequisite, permission of the department.

SOCIOLOGY

101. INTRODUCTION TO SOCIOLOGY (3)
D

An introduction to the fundamental terminology of sociology and intensive discussion of selected topics from a sociological point of view.

254. INDUSTRIAL SOCIOLOGY (3)
B

The role, status, and function of the worker in the industrial community. A consideration of changing technology and the adjustment made in the industrial community. Prerequisite, Sociology 101.

255. SOCIOLOGY OF RELIGION (3)
B

The relationship of religious beliefs and institutions to cultures and societies. Prerequisite, Sociology 101.

256. RACE RELATIONS (3)
B

The social, economic and political aspects of racial and ethnic problems in the United States, plus briefer consideration

of similar problems in Africa and Asia. Prerequisite, Sociology 101.

257. THE FAMILY 131
A

The development of the customs of courtship and marriage and of the contemporary American family. The basic causes of changes and trends of the family. Prerequisite, Sociology 101.

275. SOCIAL PROBLEMS (3)
C

The distribution and interrelationships among some types of deviance and disorganization; crime, mental disorders, addiction, suicide, family tension. Theories of causation; research projects. Prerequisite, Sociology 101.

285. COMPLEX ORGANIZATIONS (3)
D

An analysis of the processes leading to the formation, stability and instability of complex organizations. Theoretical and empirical work related to these processes will be examined. Prerequisite, Sociology 101.

750. BLACK MAN IN AMERICA (3)
D

A socio-historical analysis of the interaction of the black man and the American environment, beginning with his experiences with slavery, to his migration to urban areas and subsequent isolation in the black ghetto. A consideration of the role of power in the nature of black-white relations.

SPEECH

225, 525. HISTORY OF FILM (3)
B

Evolution of the motion picture, its high points of artistic growth in representative countries.

228, 528. RADIO, TELEVISION, FILM
AND SOCIETY (3)
A

An examination of the affective and reflective roles of the radio, television, and film media in society. Prerequisite, Speech 121.

250, 550. SPEECH AND LANGUAGE
THEORY (3)
B

The nature of speech and language and the process involved in acquiring, understanding and producing speech and language. Prerequisite, Speech 150.

253, 553. CHILDREN'S DRAMA I (3)
C

Informal dramatics, without an audience, in classroom and recreation programs, serving children's need for creative outlets and furthering awareness, self-expression, self concepts, and social growth through imagination, pantomime, and improvised story dramatization. Observation of demonstration classes.

291, 591. AUDITORY DISORDERS IN
CHILDREN (3)
A

Audiometric evaluation and procedures applied to the diagnosis of auditory impairments in children from infancy through elementary school. Language development of the pre-school deaf child. Techniques of parent counseling. Prerequisites, Speech 285 and 286.

390, 690. SEMINAR IN SPEECH
PATHOLOGY (3)
June 3 - July 8
C

Individual student reports on selected topics. Prerequisite, Speech 182.

391, 691. SEMINAR IN MASS
COMMUNICATIONS (3)
C

Individual and group research, analysis, examination, and discussion of major problems in mass communications. Prerequisites, 9 hours of courses in mass communication.

711. RHETORICAL CRITICISM (3)
D

Selected theories and methods of rhetorical criticism and their applications. Prerequisites, Speech 205 and one other course in rhetorical theory.

718. SEMINAR IN PUBLIC ADDRESS (3)
June 3 - July 8
A

Intensive study of selected topics in the history and criticism of public address. Prerequisite, permission of instructor.

748. TOPICS IN CONTEMPORARY
THEATRE (3)
June 3 - July 8
C

Concentration upon distinctive twentieth century theatrical concepts in Europe and the United States.

ZOOLOGY

101. INTRODUCTORY ZOOLOGY (3)
C-D-E, M, W, F

Principles of biology with special reference to the cell and its metabolism and to the anatomy, physiology, ecology, evolution and behavior of the major groups of the animal kingdom.

135. **INTRODUCTORY PHYSIOLOGY** (3)
C, M, W, F; Labs D-E, M, W;
D-E, Tu, Th

Circulation, respiration, digestion, metabolism, excretion, chemical and nervous coordination, muscular activity, and reproduction. Prerequisite, Zoology 101.

200. **NATURAL HISTORY** (3)
C, Tu, Th; Labs, D-E-F, Tu, Th;
D-E-F, M, W

Designed to orient the student to features of sky, climate, and terrain which are of importance to the teaching naturalist. Methods of identification, collecting data, etc., Not open to Zoology majors. Prerequisites, Botany 100; Zoology 101.

SCHOOL OF BUSINESS ADMINISTRATION ACCOUNTING

100. **INFORMATION PROCESSING FOR
BUSINESS** (3)
A; B

An introduction to business applications of automatic data processing and use of the computer as a tool for analyzing business problems.

125. **INTRODUCTION TO
ACCOUNTING I** (3)
A; B

Introduction to principles underlying the preparation of financial statements.

126. **INTRODUCTION TO
ACCOUNTING II** (3)
A; C

Continuation of Accounting 125 with major emphasis on the development and application of accounting data for planning and control.

251. **BUSINESS APPLICATIONS OF
COMPUTERS** (3)
B

Intermediate and advanced computer programming with emphasis on problems in accounting and management information systems. Prerequisite, Accounting 100.

COURSE DESCRIPTIONS

261. **INTERMEDIATE ACCOUNTING I** (3)
C

Intensive examination of fundamental concepts underlying financial reporting. Study of current literature dealing with effects of alternative methods upon measurement of periodic income. A terminal course for non-accounting majors and a foundation for the accounting major. Prerequisite, Accounting 126.

262. **INTERMEDIATE ACCOUNTING** (3)
D

Continuation of Accounting 261.

272. **ADMINISTRATIVE ACCOUNTING
AND CONTROL** (3)
A

Interpretation and evaluation of accounting data for use in managerial decisions of planning and control. Prerequisite, Accounting 126 or 127. (Not open to students majoring in Accounting.)

273. **FEDERAL INCOME TAX
PROCEDURE** (3)
B

Federal income tax laws and regulations as they affect individuals; preparation of tax returns. Prerequisite, Accounting 125 or 127.

GENERAL BUSINESS AND FINANCE

Finance

201. **CORPORATION FINANCE** (3)
D; E

Corporate financial behavior; appraisal of factors affecting decision-making regarding sources and application of funds; introduction to capital budgeting and cost of capital problem. Prerequisite, Accounting 125 and 126 or consent of instructor.

230. **PRINCIPLES OF INSURANCE** (3)
C

Risks encountered by individuals and business firms and methods and institutions which have been established to insure against financial losses. Various forms of insurance are studied primarily from the buyers' point of view.

General Business

260. **BUSINESS LAW I** (3)
B; C

Nature of law and judicial process; the concept of contract; economic functions and consequences of contracts.

262. **BUSINESS LAW III** (3)
A

The economic functions and consequences of agency, partnerships and corporations. Prerequisite, General Business 260.

270. **REAL ESTATE** (3)
B

A comprehensive survey of real estate principles and practices; mechanics of the real estate market and economic and legal factors that influence it.

STATISTICS

126. **STATISTICS 121 FOR S.B.A.** (3)
A; B

Nature of statistics; description of data; sample distribution; statistical theories and dispersion procedures; regression and correlation, time series for S.B.A. majors.

MANAGEMENT

100. **INFORMATION PROCESSING FOR
BUSINESS** (3)

Enroll for Accounting 100.

201. **PRINCIPLES OF MANAGEMENT** (3)
C

Basic course dealing with fundamental principles and practices of the managerial process in business enterprises.

214. **PERSONNEL MANAGEMENT** (3)
D

Principles and policies followed by management in recruitment, development, direction, and control of personnel.

231. **ADMINISTRATIVE THEORY** (3)
E

Principles of administration, modern organization theories, specialization, functionalization, coordination, planning, and control; authority, status, leadership, decision-making, communication, and power-structuring. Prerequisite, Management 201.

247. **PRODUCTION MANAGEMENT I** (3)
D

Basic principles of production management. Use of statistical, mathematical, and simulation methods in production, or operations, aspect of an organization's activities. Prerequisite, Management 201.

371. BUSINESS POLICY AND STRATEGY (3)
B

An integrating course embracing all organic management functions. Cases are used as subjects for analysis and systematic decision-making practice. Prerequisites, Management 201 and Senior Class standing.

391. SEMINAR IN ADMINISTRATION (3)
C

Advanced study and individual research in theory and practice of administrative organization and behavior. Prerequisite, Senior Class standing and permission of instructor.

MARKETING

201. FUNDAMENTALS OF MARKETING (3)
A

The role of marketing in our economic and social structure. The planning, distribution, pricing and promotion of goods and services to consumer and industrial markets, viewed as internal activities of the firm, and also as they are shaped by environmental forces. Prerequisites, Economics 125, Psychology 101, Sociology 101, or permission of instructor.

210. BUYER BEHAVIOR (3)
C

Analysis of buyer motivation and buying behavior, including explanatory theories of consumer market behavior and models of the decision-making process for winning patronage. Prerequisite, Marketing 201 or permission of the instructor.

212. MARKETING RESEARCH (3)
D

The systematic gathering, recording and analyzing of data about problems relating to the marketing of goods and services. Individual case study and research projects. Prerequisites, Marketing 201 and Statistics 121, or permission of instructor.

214. MARKETING MODELS (3)
B

Relates a number of mathematical concepts and techniques to the analysis and solution of marketing management problems. Mathematical models as aids to decision-making in marketing will also be included. Prerequisites, Marketing 201, Mathematics 115, 116, 117, and Statistics 121, or permission of the instructor

216. MARKETING MANAGEMENT (3)
A

An advanced understanding of the nature and problems of marketing management, focusing on the process of marketing management, the environments facing the marketing manager, and the tools available for environmental analysis and the control of marketing activities. Prerequisite, Marketing 201.

222, 522. MARKETING COMMUNICATIONS (3)
C

Development of effective marketing communication strategies based upon an understanding of the characteristics of audiences. Conceptual material from communications theory is also included. Prerequisite, Marketing 201 or permission of the instructor.

GRADUATE COURSES

411. INTRODUCTION TO ACCOUNTING (3)
C

Introduction to principles underlying preparation of financial statements and the development and application of accounting data for planning and control.

440. MANAGERIAL ECONOMICS (3)
F

Micro-economic analysis and application to business decisions such as: cost and profit analysis; demand and pricing; investment analysis and capital budgeting; and economic forecasting.

456. QUANTITATIVE METHODS I (3)
D

Business applications of algebra including ratios, proportions, logarithms, partial fraction, series, limits, convergence, combinations, and permutations. Basic concepts of differential and integral calculus. Discrete and continuous probability.

457. QUANTITATIVE METHODS II (3)
E

Laws and theories of probability and statistics, with applications in business and economics. Topics include probability models, sampling distribution, estimation, hypothesis testing, and decision theory.

700. PROBLEMS IN BUSINESS ADMINISTRATION (1-3)
Hours by arrangement

Independent study and research on selected problems in Business Administra-

tion. Permission of instructor and the dean required.

711. ACCOUNTING IN MANAGEMENT (3)
C

The production and use of accounting and other quantitative data for decision-making related to planning and control.

724. RESEARCH AND DECISION-MAKING METHODS IN MARKETING (3)
D

The applicability and utilization of quantitative research techniques to marketing problems and processes. Prerequisites, Business Administration 722 and Business Administration 756.

751. ORGANIZATION THEORY (3)
A

Examination and evaluation of the various theories of organization and the research underlying each theory to establish foundation for explanation and critical analysis of administrative processes.

752. ADMINISTRATIVE PRACTICES (3)
A

The application of principles of management to the analysis and the solution of actual integrative cases, with practice in policy formulation and managerial decision-making.

799. SEMINAR IN BUSINESS ADMINISTRATION (3)
B

The relationship of business and management to the environment in which they operate.

808. ADVANCED TOPICS IN BUSINESS ADMINISTRATION (3)
Hours by arrangement

An advanced topics section is available in each General or Functional Field of Study, the purpose of which is to facilitate investigation of current literature and research effort in these areas.

810. TUTORIAL STUDY IN BUSINESS ADMINISTRATION (3)
Hours by arrangement

Individualized secondary or applied research in special areas of guided doctoral-level investigation, permissible with consent of mentor when a suitable course in such areas is not available and the studies are related to the career-goal of the scholar.

SCHOOL OF EDUCATION

206, 506. THE ROLE OF AESTHETIC EXPERIENCE IN EARLY CHILDHOOD DEVELOPMENT (3)
C

Devoted to a review of the literature dealing with the role of aesthetic experience in the growth of children.

212, 512. THE LEARNING THEATER (3)
B

Prepares students to teach in the new experimental school programs, such as the Leicestershire model, the student centered class, the "pre-learning" situation.

218, 518. RESEARCH METHODS IN EDUCATION (3)
C

Deals with research methods and the process of scholarship in psychological, sociological, anthropological, economic, political, historical, and philosophical studies of education.

222, 522. THE EDUCATION OF THE SELF (3)
B

Provides the students with a variety of experiences aimed at the description, analysis and experimentation with their identity.

229, 529. INTERNATIONAL EDUCATION (3)
B

Survey of the field of International Education; introduction to Comparative, Developmental and International Education; exchange and international dimension of American Education.

232, 532. STUDENT REVOLUTION AND CURRICULUM CHANGE (3)
C

Examination of sources, mechanisms, and consequences of social and cultural change; analysis of theories of change and of important theoretical studies in that area.

235, 535. EDUCATION MEDIA TECHNOLOGY AND SYSTEMS (3)
A

The characteristics, capabilities and implications of a variety of media to a variety of educational strategies.

237, 537. TELEVISION IN URBAN AND SUBURBAN EDUCATION (3)
C

Deals with television as a tool for implementing instructional and educational objectives in urban and suburban environments.

240, 540. ADVANCED EDUCATIONAL MEDIA (3)
C

Study of the historical and social aspects of media on educational systems with special reference to philosophies, learning systems and communication models.

242, 542. CONTEMPORARY EDUCATIONAL PHILOSOPHIES (3)
B

Critical examination of selected contemporary philosophies of education.

251, 551. FOUNDATIONS OF EDUCATION (3)
B

Study of selected problems and issues in modern education such as educational aims, societal expectations of the schools, church-state relations, professionalism, academic freedom, curriculum and methodological emphasis, urban education, and educational innovation.

264, 564. PRINCIPLES OF ELEMENTARY EDUCATION (3)
B

277. PRINCIPLES OF SCHOOL GUIDANCE (3)
B

The need for guidance, nature of guidance and overview of guidance in schools.

284, 584. ORGANIZATION AND ADMINISTRATION OF A DISTRIBUTIVE EDUCATION PROGRAM (3)
B

Focuses on the organization and administration of Distributive Education Program at the secondary level. Examines activities that initiate, maintain and improve the Program.

315, 615. STUDENT RIGHTS IN HIGHER EDUCATION (3)
B

Emphasis and focus of the study of student rights in institutions of higher learning.

316, 616. INDIVIDUAL ALIENATION AND CONTEMPORARY HIGHER EDUCATION (3)
B, C

Analysis based on interdisciplinary readings or student alienation in the institutions of higher education in contemporary mass society.

355, 655. INTRODUCTION TO STATISTICS AND COMPUTER ANALYSIS (3)
B

Introduction to statistical principles and computer analysis basic to educational research. Reduces masses of data to a few convenient descriptive terms, and draws inferences from them.

372, 672. VOCATIONAL EDUCATION IN AGRICULTURE (3)
A

Teaching of vocational agriculture at secondary level and the survey of vocational agriculture education.

375, 675. PRINCIPLES AND METHODS OF TEACHING VOCATIONAL AGRICULTURE (3)
B

Materials, methods, policies, and special State requirements for teaching vocational agriculture in High School and special agriculture schools.

378, 678. PRACTICUM IN HUMANISTIC CURRICULUM DEVELOPMENT (3)
C

Experimentation and Documentation of different techniques and procedures developed by F. Pearls, G. Brown, G. Kelley.

385, 685. PRACTICUM IN EDUCATION (3)
Hours by arrangement

386, 686. SPECIAL PROBLEMS IN EDUCATION (3)
Section 1. Cataloging Educational Materials (3)
Section 2. Comprehensive Achievement Monitoring Hours by arrangement. (3)

391, 702. INDEPENDENT STUDY (1-6)
Hours by arrangement

415. FILM WORKSHOP (3)
B

519. CURRICULUM EVALUATION (3)
B

Seminar utilizing the writings of Lyler, Cronbach, and Stufflebram and the work of the UCLA Research and Development Center and outcome measures for curriculum and innovation in education.

526. CURRICULUM DEVELOPMENT IN INTERNATIONAL EDUCATION (3)
A
Examination of resources and concepts of curriculum development in International Education.
577. COUNSELING STRATEGIES (3)
C
632. INTRODUCTION TO MEASUREMENT AND EVALUATION FOR RESEARCH MAJORS (3)
B
Presentation of the basic principles of measurement. Topics covered will include descriptive statistics, reliability, validity, principles of test construction, item analysis and a review of standardized tests.
633. TEST THEORY (3)
C
Study of the theory of mental tests beginning with the classical test theory model and including such topics as reliability, validity, item analysis, and latent structure models.
649. CURRENT CONCEPTS, TRENDS, AND PRACTICES IN VOCATIONAL/TECHNICAL EDUCATION (3)
C
Stresses emerging concepts resulting from a critical evaluation of research and legislation involved in the development of vocational and technical education programs.
686. SPECIAL PROBLEMS IN EDUCATION: GOVERNMENT IN HIGHER EDUCATION: ALTERNATIVES AND INNOVATIONS (3)
B
Section 2
688. PRACTICUM IN INTERNATIONAL EDUCATION (3)
B
701. PRACTICUM IN SCHOOL GUIDANCE (3)
B

Seminar in Education

705. SECTION I: PIAGET'S DEVELOPMENT THEORY (3)
C

Review of theory and emphasis on application in early childhood and elementary education systems.

705. SECTION II: RESEARCH INTO TEACHER EFFECTIVENESS (3)
C

A review of past attempts at a solution to the criterion problem including the works of Barr, Biddle, McCall, Ryans, Medlye, and Mitzbls, and Remmers. An introduction to the current work of Fattu, Kersh, and Allgrand Gabb. Course will include findings, reviews of research designs, scales, and analysis of problems.

705. SECTION III: EXPERIMENTAL DESIGN AND ANALYSIS IN EDUCATIONAL RESEARCH (3)
C

Internal and external validity in experimental design, complete factorial, repeated-measurer, and designs, the analysis of variance and covariance with such designs, homogeneity of variance and covariance, multiple comparisons, selected non-parametric techniques.

705. SECTION IV: ELEMENTARY SCHOOL SOCIAL STUDIES: CURRENT METHOD (3)
B

705. SECTION V: ELEMENTARY SCHOOL PRINCIPALSHIP (3)
C

706. SEMINAR IN GUIDANCE (3)
B

710. SEMINAR IN MATH EDUCATION (3)
B

711. SEMINAR IN SOCIAL STUDIES (3)
B

716. WORKSHOP IN REM. READING (3)
C

718. WORKSHOP IN EDUCATIONAL TELEVISION (3)
A

732. MEDIA PRODUCTION SURVEY (3)
A

736. SEMINAR IN CURRICULUM DEVELOPMENT IN VOCATIONAL TECHNICAL EDUCATION (3)
B, C

Development of curricula based on special problems, current research, and social or technological changes

767. DEVELOPMENTS IN ELEMENTARY SCHOOL MATHEMATICS (3)
C

A critical evaluation of the current literature, research and studies in the curriculum and teaching of elementary school mathematics.

768. DEVELOPMENT IN ELEMENTARY SCHOOL SCIENCE (3)
B

A critical evaluation of the current literature, research and studies in the curriculum and teaching of elementary school science.

782. CHILDREN'S LITERATURE (3)
C

The basic types and foremost works in the literature for children. Attention to different interest and vocabulary levels, and to the criteria for selection of lists for individual children.

785. TECHNIQUES IN REMEDIAL READING (3)
B

786. INTRODUCTION TO RESEARCH METHODOLOGY FOR NON-RESEARCH MAJORS (3)
C

811. RECENT DEVELOPMENT SECONDARY SCHOOL SCIENCE (3)
A

A critical evaluation of the current literature, research and studies in the curriculum and teaching of secondary school science.

812. NEW DEVELOPMENTS IN SECONDARY SCHOOL ENGLISH (3)
B

A critical evaluation of the current literature, yearbooks, research, and experiments in the curriculum and teaching of English.

813. NEW DEVELOPMENTS IN SECONDARY SCHOOL SOCIAL STUDIES (3)
A

A critical evaluation of the current literature, research, and studies in the curriculum and teaching of secondary school social studies.

833. SEMINAR ON KNOWLEDGE DIFFUSION AND UTILIZATION (3)
C

838. SEMINAR IN SCIENCE EDUCATION (3)
B

Study of the current literature and the research in Science Education and researchable problems and of research strategies which may be applicable.

839. HISTORY AND THE SOCIAL SCIENCES: AN INTERDISCIPLINARY APPROACH (3)

Investigation of the possibilities for developing viable interrelationships between history and the various social sciences in secondary school instruction.

880. CURRENT ISSUES IN EDUCATION (3)

Issues confronting the American public schools. An in-depth approach will be employed viewing historical antecedents, present conditions, and future alternatives.

881. COMPARATIVE EDUCATION (3)

884. EDUCATIONAL SOCIOLOGY (3)

The American public schools will be examined as one of the many social institutions in the American culture. Particular emphasis will be focused on viewing population, pressure groups, and the social structure of the schools within the community.

910. COUNSELING THEORY (3)

Study of methodology, philosophies, studies, problems, and issues of school counseling.

911. COUNSELING PROCEDURES (3)

Instruments and techniques used in guidance work such as an observation, methods of individual appraisal, record keeping, and school liaison practices.

912. OCCUPATIONS AND PLACEMENT (3)

The collection, evaluation and use of occupational, educational, and placement information with individual and groups of students in school guidance.

914. STUDENT PERSONNEL SERVICES IN HIGHER EDUCATION (3)

Origin, growth, and operation of student personnel services in American colleges. Research and methods of evaluation. Specific personnel services such as selection and admission of students, orientation to college life; student financial aid, student activities, and discipline.

915. GROUP ACTIVITIES IN GUIDANCE (3)

A guidance study of school groups. Attention will be given to group dynamics, discussion techniques, group counseling, sociometric methods, and other school group activities.

928. GUIDANCE INTERNSHIP (3-6)

Supervised on-the-job counseling experience. Work includes direct counseling, individual supervisory conferences, writing of case reports, and the analysis of taped counseling sessions.

954. PUBLIC SCHOOL FINANCE (3)

The study of the economics of public education, sources of school revenue, taxation, and federal, state, and local plans of school fiscal support.

956. PRINCIPLES OF SCHOOL LAW (3)

A review of the legal relations of school personnel covering experiences in school and community, presented in a series of selected cases.

958. SCHOOL PERSONNEL ADMINISTRATION (3)

The leadership role in staff performance and duties, planning and promotion of continuous programs of inservice training, recruitment and development of personnel, internal organization and administration.

961. CASE STUDIES IN EDUCATIONAL ADMINISTRATION (3)

A series of situations involving the role of the school administrator in a democracy.

994. INTRODUCTION TO BEHAVIORAL RESEARCH (3)

Discussion and lecture on what is a fact, hypothesis generation, nature of knowledge, validity, arrangements, variance explanation.

**SCHOOL OF ENGINEERING
CHEMICAL ENGINEERING**

288. UNIT OPERATIONS LABORATORY (3)

Study and operation of pilot plant size equipment illustrating unit operations. Emphasis on securing of accurate data, correct operating techniques and on report writing. Prerequisites, Chemical Engineering 256 and 257.

713. ANALOG-HYBRID SIMULATION (3)

Hours by arrangement
Analog Simulation (emphasis on efficient scaling), Iterative Analog Operation, Digital-Analog Operation.

CIVIL ENGINEERING

140. STATICS (3)

Resultants of force systems, equilibrium of force systems, friction, first and second moments, center of gravity. Prerequisite, integral calculus concurrently.

141. STRENGTH OF MATERIALS I (3)

Simple and combined stresses and strains in tension, compression, and shear; torsion; stresses and deflections in beams. Prerequisite, Civil Engineering 140.

142. DYNAMICS (3)

Motions of particles and rigid bodies and the force systems causing these motions. Prerequisite, Civil Engineering 140.

230. THEORY OF STRUCTURES I (3)

An elementary treatment of statically determinate structures, especially buildings and bridges. Prerequisite, Civil Engineering 141.

257. FLUID MECHANICS (3)

Properties and behavior of fluids, involving laws of hydrostatics, kinetics and dynamics. Flow measurement, hydraulic machinery, flow in pipes and open channels. Prerequisite, Civil Engineering 141.

385. CIVIL ENGINEERING PROJECT (3)

Hours by arrangement
Special study or project work leading to a written or oral report. Admission by permission of instructor. May be repeated for credit.

700. SPECIAL PROBLEMS (3-6)

Hours by arrangement

ELECTRICAL ENGINEERING

385. SPECIAL PROBLEMS (1-3)

Hours by arrangement
An individual investigation carried out under the supervision of an interested staff member, or a class study of recent advances and current problems in a specialized field. Prerequisite, permission of instructor.

700. SPECIAL PROBLEMS (1-3)
Hours by arrangement

A study of recent advances and current problems in a specialized field of Electrical Engineering. Prerequisite, permission of instructor.

INDUSTRIAL ENGINEERING

256, 556. DATA PROCESSING AND INFORMATION HANDLING SYSTEMS (3)
A

Principles and applications of data processing and electronic computer systems for use by Industrial Engineers as a management tool for control and decision making.

271, 571. BASIC PROBABILITY FOR ENGINEERS (3)
A

A basic study of probability theory including: sample spaces; discrete and continuous random variables; functions of random variables; marginal and joint probability; density and cumulative distribution functions; and moments. Prerequisite, Math 124.

354, 654. INDUSTRIAL ENGINEERING ECONOMICS I (3)
B

A study of the bases for comparison of alternatives in engineering projects, break-even and minimum cost points, evaluation of proposals for new activities, economy of operations, the evaluation of public activities, the output and life of typical items of engineering and sizes, economic purchase quantities, the selection and replacement of structures and machines.

378, 678. PRODUCTION PLANNING AND CONTROL (3)
C

The principles and methods used to regulate production activities in keeping with the manufacturing plan. Prerequisites, I.E. 151, 272, 379.

385. INDUSTRIAL ENGINEERING PROJECTS (1-3)
C

Work for a senior thesis or a special program. Admission by permission of instructor.

700. SPECIAL PROBLEMS IN INDUSTRIAL ENGINEERING (3)
B

Special investigational or research problems in Industrial Engineering, the scope to be varied to meet specific conditions.

MECHANICAL AND AERO-SPACE ENGINEERING

135. ENGINEERING MATERIALS AND PROCESSES (3)
A

Study of the atomic and molecular phenomena responsible for the behavior of materials. The relationship between the atomic structure of materials and their behavior is emphasized. Prerequisite, Chemistry 112 or 114.

137. ENGINEERING MATERIALS AND PROCESSES LABORATORY (1)
Lab, D-E, Tu, Th

Laboratory work in materials in connection with Mechanical and Aero-space Engineering 135.

144. MECHANICS I (3)
B

Elements of statics and strength of materials. Prerequisite, integral calculus concurrently, required by cooperative student program.

246. MECHANICS III (3)
C

Advanced topics in dynamics and strength of materials. Prerequisite, Mechanical and Aero-space Engineering 144.

256, 556. DATA PROCESSING AND INFORMATION HANDLING SYSTEMS (3)
A

Principles and applications of data processing and electronic computer systems for use by industrial engineers in management for control and decision-making. Prerequisite, I.E. 151, Engineering 103, 104, or approval of instructor.

163. ENGINEERING THERMODYNAMICS I (3)
C

The laws of thermodynamics are introduced and applied to various energy-transforming devices. Property relations. Emphasis is on the science of thermodynamics with the purpose of providing a background for further study in those areas that involve thermodynamic principles. Prerequisite Physics 106, Mathematics 173 required by cooperative student program.

264. ENGINEERING THERMODYNAMICS II (3)
A

Application of the laws of thermodynamics to energy conversion devices. Introduction to irreversible thermodynamics. Prerequisite, MAE 163, required by cooperative student program.

267. MAE LAB I (3)
A, B, C
Special course June 22 to July 10

Calibration and application of instruments used in the testing of mechanical engineering apparatus. Introduction to the theory of experimentation. Special session required for cooperative students.

268. KINEMATICS (3)
C

Mechanism, including velocity and acceleration diagrams, instant centers, gear teeth and gear trains, cams, and various speed transmissions. Prerequisite, Mechanical and Aero-space Engineering 246.

303, 603. ADVANCED THERMODYNAMICS (3)

Review of classical thermodynamics and conventional energy conversion. Statistical thermodynamics. Introduction to irreversible thermodynamics and direct energy conversion. Prerequisite, graduate standing or permission of instructor.

307, 607. ADVANCED DYNAMICS (3)
C

Advanced dynamics of particles, systems of particles, variable mass systems, and rigid bodies. Gyroscopic motion. Rotating and accelerating frames of reference. Use of energy methods, LaGrange's equations, Hamilton's principle, and Eulerian angles in engineering problems. Prerequisite, graduate standing or permission of instructor.

385. SPECIAL TOPICS (3)
Hours by arrangement

Special study or project work leading to a written or oral report. Admission by permission of instructor. May be repeated for credit.

700. SPECIAL PROBLEMS IN MECHANICAL AND AERO-SPACE ENGINEERING (3)
Hours by arrangement

Special investigational or research problems, the scope to be varied to meet specific conditions. Prerequisite, as required by the program.

SCHOOL OF HOME ECONOMICS NUTRITION AND FOOD

352. HUMAN NUTRITION (3)
July 20 - August 7
B, C

Absorption, utilization and interrelation-

ship of food nutrients. Factors and critique of methods for determining nutrient requirements. Prerequisites, Chemistry 220 and permission of instructor

- 373, 673. **NUTRITION DURING GROWTH AND DEVELOPMENT** (3)
August 10 - 28
B, C

Nutrition as it affects physical growth and development. Criteria for evaluating nutritional status of children. Prerequisite, NF 127 or 352.

SCHOOL OF NURSING

111. **FUNDAMENTALS OF NURSING** (3)
Hours by arrangement

A continuation of Nursing 110. Prerequisite, Nursing 110.

SCHOOL OF PHYSICAL EDUCATION

119. **SKILLS AND COACHING COURSES** (2)
Hours by arrangement

This course consists of a variety of skills and coaching courses.

142. **KINESIOLOGY** (3)
D

Anatomical application as a basis to a thorough understanding of mechanical problems in motor skills. Prerequisite, Physical Education 141.

200. **SOCIOLOGY OF SPORT AND PHYSICAL ACTIVITY** (3)
A

Study of social action theory, group structure, social institutions, social processes, current cultural trends, and social problems in sport. Prerequisite, Sociology 101.

202. **HISTORY OF SPORT AND PHYSICAL ACTIVITY** (3)
C

A survey of the history of sport, dance, and other forms of organized, physical activity throughout the Western world. Prerequisite, History 100 or 101.

253. **PHYSICAL EDUCATION FOR ELEMENTARY SCHOOLS** (3)
B

Discussion of program content for elementary school physical education and presentation of methods used for teaching physical education activities at the elementary school level.

275. **PREVENTION AND CARE OF INJURY IN ACTIVITY** (3)
E

Theory and techniques in preventing and treating all types of physical injuries including first aid treatment as well as therapeutic aids and clinical use of physiotherapy equipment. Prerequisite, PE 142.

278. **PHYSIOLOGY OF EXERCISE** (3)
B

Application of basic physiological concepts of the program of physical education, emphasizing physiological effects and adjustments accruing from participation in physical activity. Prerequisite, Zoology 135.

700. **SPECIAL PROBLEMS** (1-6)
Section 1 - June 1 - July 10
Section 2 - July 13 - August 21
Hours by arrangement

Individual research on a topic not covered by any existing courses. Normally confined to an extension of the content of an existing course rather than an introduction to a new area of study. Prerequisites, permission of instructor and director of the graduate program.

763. **HISTORY OF COLLEGE SPORTS** (3)
C

A study of the developments in sport at educational institutions from the age of unorganized play to the present.

772. **ATHLETICS: PHILOSOPHY AND INQUIRY** (3)
D

A critical analysis of those historical, sociological and psychological factors which have influenced the concept of athletics and caused issues in programs associated with this concept.

800. **MASTER'S THESIS** (3-6)
Section 1 - June 1 - July 10
Section 2 - July 13 - August 21

813. **MEASUREMENT THEORY AND HUMAN MOVEMENT RESEARCH** (3)
June 1 - July 10
C

The theory of the construction of evaluative instruments in human movement with emphasis on a critical examination of existing measurement devices. Prerequisites, PE 274 and 712.

823. **EXPERIMENTAL PHYSIOLOGY OF EXERCISE** (3)
June 1 - July 10
A

Experimental investigation of the physiological effects of exercise. Prerequisite, PE 621.

833. **FORCES AND MOMENTS OF FORCE IN HUMAN MOTION** (3)
June 1 - July 10
B

The analysis of whole body muscle action during movement and impact. Prerequisite, PE 732.

843. **NEUROMUSCULAR FATIGUE** (3)
B

Analysis of fatigue and recovery processes in gross human motor activity. Prerequisites, PE 621, 742, 813, and Stat 551 and 561.

900. **DOCTORAL DISSERTATION** (1-6)
Section 1 - June 1 - July 10
Section 2 - July 13 - August 21
Hours by arrangement

DEPARTMENT OF PUBLIC HEALTH

123. **DYNAMICS OF PERSONAL AND COMMUNITY HEALTH** (3)
C

Development of understanding and attitudes relative to personal, family and community health needs. Attention given to mental and physical well being, drugs, sexuality, communicable and chronic diseases and health services.

- 311, 611. **HUMAN SEXUALITY AND SEX EDUCATION** (3)
Tu, Th, 7:00 - 10:00 P.M.;
M, W, 7:00 - 10:00 P.M.

Promotes insight into human sexuality in relation to modern life. Primary emphasis on human sexuality as it may appear in the infant, the child, the adolescent, and the young married adult, as well as an examination and clarification of some of the crucial dynamics of the present. Prerequisites, junior or senior standing and permission of the instructor.

- 312, 612. **PUBLIC HEALTH AND FAMILY PLANNING** (3)
B

Public health problems associated with family health and population limitation. Historical factors, limitation methods, and barriers and facilitators related to family health and family size. Prerequisite, Sociology 101, Public Health 123, or permission of the instructor.

382. **SUPERVISED FIELD TRAINING** (3-10)
Hours by arrangement

A field training program with an official health agency, approved by the Department. This must be under faculty supervision.

385. PROBLEMS (3)
Hours by arrangement

Qualified seniors who have obtained permission from the Department may arrange for independent work on special problems.

700. SPECIAL PROBLEMS IN PUBLIC HEALTH (3-6)
Hours by arrangement

Special investigational or research problems in public health for advanced students. The scope of the work can be varied to meet specific conditions.

782. SUPERVISED FIELD TRAINING (INTERNSHIP) (3-12)
Hours by arrangement

Designed to offer students majoring in public health a significant opportunity for

supervised field observation and professional experience in selected public health agencies. Assignments will be in either associate functions or internships. Departmental staff; consultants in public health agencies.

800. MASTER'S THESIS (6-10)
Hours by arrangement



UNIVERSITY OF MASSACHUSETTS CAMPUS GUIDE

Agricultural Engineering Bldg. — F4
Arnold House — E5
Astronomy Bldg. — E4
Athletic Fields, Men — G2
Athletic Fields, Women — D5
Baker House — F7
Bartlett Hall — G2
Berkshire House — H1
Blindfold House — G4
Bowditch Lodge — J3
Boyer Physical Education Bldg. — H4
Brett House — E7
Brooks House — F7
Business Administration, School of — H6
Butterfield House — G8
Campus Center (Lucy) — F5
Campus Center Parking Garage — F4
Central Stores — F3
Childbearing House — F7
Chenoweth Laboratory — F4
Clark Hall — G6
Cold Storage Bldg. — F4
Conservation Bldg. — F6
Cubane House — F5
Dickinson Hall — G4
Dining Hall, Franklin, South — G5
Dining Hall, Worcester, North — F6
Draper Hall — F4
Durkin Conservatory — F6
Duitch House — D5
East Experiment Station — E5
Education, School of — C5
Engineering, Main Bldg. — E4
Engineering Bldg., East — F4
Engineering & Physics Shop — E4
Faculty Club — F6
Farley Lodge — J3
Farm Service Bldg. — F3
Fernald Hall — G4
Fine Arts Center (1973) — G5
Fisher Laboratory — F7
Food Laboratory — F4
French Hall — F6
Gossens Laboratory — E5
Goodell Library — G4
Gorman House — F7
Graduate Research Center (1971) — E5
Greenough House — F1
Grove Hall — G4
Guinness Engineering Bldg. — E4
Hanna House — D5
Hampshire House — F5
Haskins Laboratory — F5
Hatch Laboratory — F4
Metter Hall — H5
Hicks Physical Education Bldg. — H5
Hills House — G7
Holdsworth Hall — E4
Infermary — F7

Johnson House — D5
Kinsman House — E5
Leach House — D5
Lewis House — D6
Library, University (1971) — G5
Lincoln Apartments — I6
Mather Hall — F4
Mahar Auditorium — H6
Middletown — E3
Mink's Meadow Elementary School — C5
Morse Hall & Annex — F6
Murray House — E5
Morse Hall — G5
Morse House — H5
Morse House — G7
Morse House — G4
Morse Science Center — F6
Morse Hall — H5
Morse Hall Annex — H5
Observatory — F6
Old Chapel — G5
Old Infirmary Group — E6
Orchard Hill Residential College — E7
1 — Grayson
2 — Webster
3 — Dickinson
Page Laboratory — E4
Photo Center — F4
Physical Plant Bldg. — F3
Power Plant — F4
President's House — F7
Public Health Center, Western Mass. — F6
Sawyer Hall — F6
South College — G4
Southwest Residential College — I, J, 4, 5
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*Buildings that contain Civil Defense Fallout Shelters

*Buildings that are nonhabitable

• Parking Lots

— Under Construction

• Traffic Control Points



UNIVERSITY OF MASSACHUSETTS



AMHERST • BOSTON • WORCESTER

Summer Session 1970
University of Massachusetts
Amherst, Massachusetts 01002



1970-1971 Undergraduate Courses and Faculty
UNIVERSITY OF MASSACHUSETTS BULLETIN

The Undergraduate Catalog of the University of Massachusetts consists of the Courses and Faculty Bulletin and the General Information Bulletin. All students are responsible for observing the rules and regulations thus published, as well as those published in the Student Handbook. The University reserves, for itself and its departments, the right to change its announcements or regulations whenever such action is deemed appropriate or necessary.

It is the policy of the University of Massachusetts that any and all acceptance of students for admission be without regard to race, color, or national origin.

VOLUME LXII

MARCH, 1970

NUMBER II

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**1970-1971
UNDERGRADUATE
COURSES AND FACULTY**

**UNIVERSITY OF MASSACHUSETTS
AT AMHERST**

1970-1971 Academic Calendar

1970

Tuesday, September	8	Graduate registration
Wednesday, September	9	Undergraduate registration
Thursday, September	10	Undergraduate course changes
Friday, September	11	Classes begin
Monday, October	12	Holiday
Saturday, October	31	Midterm marks close
Wednesday, November	11	Holiday
Wednesday, November	25	Thanksgiving recess begins after last class
Monday, November	30	Classes resume and counselling period begins (classes NOT suspended)
Tuesday, December	1	Thursday class schedule will be followed
Friday, December	4	Counselling period ends
Wednesday, December	23	Last day of classes; Christmas vacation begins after last class

1971

Monday, January	4	Reading
Tuesday, January	5	days
Wednesday, January	6	Final examinations begin
Friday, January	15	Final examinations end
Tuesday, January	26	Graduate registration
Wednesday, January	27	Undergraduate registration
Thursday, January	28	Undergraduate course changes
Friday, January	29	Classes begin
Monday, February	15	Holiday
Friday, February	19	Monday class schedule will be followed
Saturday, March	20	Spring vacation begins after last class; midterm marks close
Monday, March	29	Classes resume
Monday, April	19	Holiday
Monday, May	3	Counselling period begins (classes NOT suspended)
Friday, May	7	Counselling period ends
Monday, May	17	Last day of classes
Tuesday, May	18	Reading
Wednesday, May	19	days
Thursday, May	20	Final examinations begin
Saturday, May	29	Final examinations end
Saturday, May	29	Commencement

TABLE OF CONTENTS

BOARD OF TRUSTEES	4
GENERAL ACADEMIC REGULATIONS	5
DIRECTORY OF COURSES	13
College of Agriculture	13
College of Arts and Sciences	23
Computer Science Program	78
School of Business Administration	79
School of Education	86
School of Engineering	89
School of Home Economics	103
School of Nursing	111
School of Physical Education	113
Department of Public Health	116
Division of Military and Air Science	121
GENERAL OFFICERS ADMINISTRATION	124
FACULTY	131
INDEX	159

The Board of Trustees

Organization of 1969

Term Expires

JOSEPH P. HEALEY of Arlington	1970
FRANK L. BOYDEN of Deerfield	1974
EDMUND J. CROCE of Worcester	1969
DENNIS M. CROWLEY of Boston	1973
ROBERT P. GORDON of Lincoln	1971
JOHN W. HAIGIS, JR. of Greenfield	1974
MRS. ELIOT S. KNOWLES of South Dartmouth	1974
LORENZO D. LAMBSON of Southwick	1973
LOUIS M. LYONS of Cambridge	1971
JOHN J. MAGINNIS of Worcester	1972
CYNTHIA J. OLKEN '70 of Sharon	1970
CALVIN H. PLIMPTON of Amherst	1969
GEORGE L. PUMPHRET of Dorchester	1974
MRS. GEORGE R. ROWLAND of Osterville	1972
MRS. O. PHILLIP SNOWDEN of Roxbury	1976
MARTIN SWEIG of Winthrop	1969
FREDERICK S. TROY of Boston	1970
CHRISTOPHER J. WELDON of Springfield	1976

Ex Officio

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JOHN W. LEDERLE of Amherst, President of the University
NATHAN CHANDLER of Sterling Junction, Commissioner of Agriculture
ALFRED L. FRECHETTE, M.D. of Brookline, Commissioner of Public Health
MILTON GREENBLATT, M.D. of Newton, Commissioner of Mental Health
NEIL V. SULLIVAN of Cambridge, Commissioner of Education

Officers of the Board

JOSEPH P. HEALEY of Arlington, Chairman
FRANK L. BOYDEN of Deerfield, Honorary Chairman
ROBERT J. McCARTNEY of Amherst, Secretary
KENNETH W. JOHNSON of Amherst, Treasurer

General Academic Regulations

Attendance

The attendance of students at all regularly scheduled classes at the University is expected. No administrative control of attendance is exercised except as hereinafter provided. In cases of illness, students are to explain their absences directly to their instructors. The grade of the student who has met the requirements of the instructor in making up his work shall not be reduced for absence because of illness. Students are not to be penalized for official off-campus trips.

Conduct

The customary high standard of college men and women in honor, self-respect, and consideration for the rights of others constitutes the ideal of student conduct. The privileges of the University may be withdrawn from any student at any time if such action is deemed advisable. It should be understood that the University, acting through the President or any administrative officer designated by him, distinctly reserves the right, not only to suspend or dismiss students, but also to name conditions under which they may remain in the institution. Hazing in the sense of the punishment or humiliation of students is not permitted.

Grade Reporting and Academic Regulations

Enrollment in and graduation from the University involve both quality and quantity of work. The quantity of work is measured by the credits obtained by successful completion of courses. The quality of work is measured by grades. Each grade is equated with a quality point as noted below.

GRADING SYSTEM

The aims of the letter system of grading are to divorce the evaluation of student achievement from any rigid numerical system and to encourage judgment on the basis of total performance. This philosophy recognizes that performance measurement is a relatively inexact art.

Each instructor may use some numerical system of preliminary grading in order to evaluate examinations, papers, laboratory work, etc.; many will use the traditional percentage method. However, it is not automatically assumed that 80–89 is a B or that 90–99 is an A, or that the grading

pattern is to be fitted to a given performance curve. A student's performance is evaluated on its own merits and the final grade awarded according to the definitions accompanying the letter grades.

No matter what system of grading is used close decisions will always have to be made—sometimes to the apparent advantage of the student and sometimes to his disadvantage. Proper use of the letter grading system, however, avoids emphasis on fine distinctions which may merely be manifestations of the grading device, rather than real differences in student performance.

Grades are reported according to the following letter system: Grades of A, B, and C are given for satisfactory work; grades of D and F are given for unsatisfactory performance. A grade of D in a single course indicates little aptitude or application on the part of the student in that particular subject. Grades of D and F in a number of courses are indicative of work below standard for college work and may be cause for dismissal.

A—*Excellent*—Outstanding accomplishment, showing distinction in intellectual achievement. This grade is not automatically assigned to those students who have received the highest ranks in a class.

B—*Good*—Performance of consistently high quality.

C—*Acceptable*—Performance which fulfills essential course requirements in quality and quantity and which meets the acceptable standard for graduation from the University.

D—*Passing*—(but not satisfactory)—Performance which falls below the standard for graduation but for which course credit is granted.

F—*Failing*—Performance undeserving of course credit.
Inc.—Incomplete.

The grade of Incomplete shall only be reported:

When a portion of the assigned or required class work or the final examination has not been completed because of necessary absence of the student, serious illness, extreme personal circumstances, or for scholarly reasons at the request of the instructor. If the student's record is such that he would fail the course regardless of the result of the missing work, he is to be given a failure.

In order to qualify for an Incomplete, a validation form is obtained from the instructor. Such a form would not

be issued by him if the quality of the work to date did not justify it. This form is countersigned by the Health Services or the appropriate Personnel or Academic Dean with copies returned to the instructor and filed with the Registrar.

A student can obtain credit for an Incomplete only by finishing the work of the course within two weeks from the date of the final examination. The grade of Incomplete is converted to a failure if the course requirements have not been satisfied by this time. Exceptions to the two week deadline may be requested on the validation form by the appropriate agency in cases of protracted illness, or critical personal problems, or for scholarly reasons at the request of the instructor. The initiative for removal of the Incomplete grade rests with the student, but faculty members giving an Incomplete grade must be responsible for making suitable arrangements for its removal.

An Incomplete on a final grade report is calculated as an F in arriving at a temporary quality point average. When the Incomplete is later converted to a grade, the permanent record is changed and the student is notified.

PASS-FAIL COURSES

The purpose of the Pass-Fail program is to encourage full-time students to be usefully venturesome in the choice of their elective courses.

Any full-time student is eligible to use a pass-fail option in **one—and only one**—course each semester. This one course option is in addition to Physical Education 100, which may be taken on a pass-fail basis, and in addition to any **Education courses which can only be taken on a pass-fail basis**. This option is open to students in all courses except those needed by the student to satisfy core or distribution requirements of the University or of his school, and courses in a student's major (unless his department rules otherwise). An eligible student taking a full load in summer work (12 credits) may be allowed the pass-fail option during the second summer session.

A pass-fail student who does passing (i.e., A through D) work in a course shall be given a grade of "P." A "P" in a course earns a student graduation credits, but the course is in no way counted in his quality point average calculations. A pass-fail student who does failing work in a course shall be given the grade of "F." Credits for a failed course are included in quality point calculations.

The student has ten days to decide whether to exercise this option at all and, if he wishes to use it, in what course to "place" it. The card must be returned to the Registrar within the ten-day period. Students are required to sign

the card in recognition that the pass-fail course cannot be used to satisfy core or distribution requirements. A pass-fail course cannot be converted to regular grading basis after the ten-day period has passed.

QUALITY POINTS

Quality points per semester hour will be assigned as follows: A, 4; B, 3; C, 2; D, 1; F, 0.

Averages will be computed as follows:

Semester Grade Point Average: To compute the semester grade point average, the total points earned will be divided by the total credits carried, which includes the total credits earned and failed. Required non-credit courses (language repeats) are included in the semester and cumulative averages as 3-credit courses, although not added as credits toward graduation. Averages are rounded to the nearest tenth.

Cumulative Average: To compute the cumulative grade point average, the total points earned will be divided by the total credits carried, which is the sum of the total credits earned and failed.

Semester and cumulative grade point averages will be recorded to one decimal place. In the senior year, the cumulative average for the student's total academic work will be recorded to two decimal places.

In computing grade point averages the following will not be included:

1. Grades not earned at the University.
2. Courses satisfied by advanced placement.
3. A pass-fail course which has been successfully completed.

REPEATED COURSES

A course once passed may not be repeated for any reason.

FAILURES

If a failed course is not required, a substitution may be made. Although repeated, the original failed course continues a part of the student's quality point and course record.

SCHOLASTIC WARNING

A student whose semester average falls below the cumulative average required for retention of his class is warned

by a statement on his copy and his parents' copy of the grade report. This warning is to indicate that continued below-standard performance may result in failure to graduate or academic dismissal.

SCHOLASTIC TERMINATION

Termination from the University for scholastic reasons shall be based upon regulations to be administered by the Committee on Admissions and Records. Changes in these regulations may be made by the Faculty Senate. By action of the Senate, the following cutting points and graduation requirements have been set:

1. Graduation average is 1.80.
2. Second semester junior year, first semester senior year:
Cumulative average must be 1.7 unless the semester average is 1.8 or better.
3. Second semester sophomore year, first semester junior year:
Cumulative average must be 1.6 unless the current semester average is 1.7 or better.
4. Second semester freshman year, first semester sophomore year:
Cumulative average must be 1.5 unless the current semester average is 1.6 or better.
5. Transfer and Returning Students
A transfer student must satisfy the quality point average requirements of the second semester of the freshman year. Thereafter a transfer student is required to meet the academic standards of the class to which he is assigned.
A returning student must satisfy the cumulative quality point average of his assigned class.
6. Effective with the class of 1972, the above cutting points are raised as follows: first semester freshmen 1.0; second semester freshmen, first semester sophomores, and first semester transfers cumulative average must be 1.5 unless semester average is 1.6; second semester sophomores and first semester juniors cumulative average must be 1.7 unless semester average is 1.8; second semester juniors and first semester seniors cumulative average must be 1.9 unless semester average is 2.0; 2.00 average required for graduation.

No new quality point requirement is imposed on students at the end of the fall semester: the cutting point in effect for the class at the end of the preceding semester

remains in effect for the class until the next requirement takes effect at the end of the academic year.

Twelve credits in Summer Session (freshmen, 10) is considered one semester's work for retention calculations.

SCHOLASTIC PROBATION

1. Conditions

- A. Students who fail to meet the retention average for their class by not more than one-tenth of a point are designated as being on scholastic probation. No academic termination takes place. A student may be allowed one freshman probation and only one upperclass probation semester during his college career.
- B. Any student who fails to meet the retention average for his class by more than one-tenth of a point for the first time is terminated and charged with an academic suspension. He automatically is placed on upperclass scholastic probation at the time of his readmission and is ineligible to continue on scholastic probation beyond the semester of his return. A student who fails to meet the retention average for his class for a second time will be terminated and charged with final academic dismissal and will become ineligible to submit an application for readmission.
- C. Effective with the class of 1972 the first semester freshman probation is changed from six-tenths of a point to one-tenth of a cutting point difference.

2. Eligibility

- A. While on scholastic probation students shall not be eligible to hold office in any recognized student organization, to represent the University in any capacity on or off campus, to participate actively in any non-academic extracurricular activity (including athletic, fraternal, dramatic, musical and publications activities).
- B. Students on scholastic probation are not permitted to register a car unless they are commuting from home.
- C. The Board of Admissions and Records shall be charged with modifying, extending or limiting the restrictions on a student during his period of scholastic probation, and shall report all such modifications to the Faculty Senate periodically.

3. Termination

- A. A full Summer Session program, normally eleven or twelve credits, is considered as one semester's work for purposes of removing probation.
- B. Grades and credits transferred to the University from other institutions shall not normally be considered in reviewing a student's probationary status.

READMISSION

A student who leaves the University in good standing is eligible to return at any time providing the appropriate application for readmission is submitted suitably in advance. (November 1 and June 1 are deadlines for upcoming semesters.)

A student terminated for scholastic deficiency, but otherwise entitled to honorable dismissal, may not be readmitted to the next regular semester. Readmission following the first termination is possible following one semester's absence. A student twice terminated for scholastic deficiency is not permitted to apply for readmission. A first termination is considered academic suspension. A second termination is considered final academic dismissal.

A suspended student who is readmitted is automatically placed on scholastic probation for one semester and not entitled to any subsequent scholastic probation continuance. He must satisfy the quality point requirements of the class to which he is reassigned.

FINAL EXAMINATIONS

It is University policy not to require a student to take more than two final examinations in one day. Any student who finds he has a conflict in his examination schedule or more than two in one day should report this to the Schedule Office, 168 Whitmore Administration Building.

GRADUATION REQUIREMENTS

It is the responsibility of the individual student to review his own progress toward graduation and the fulfillment of University and school requirements. Through his own initiative, he should address questions concerning these matters to his adviser, Dean or the Registrar.

All four-year curricula of the University conform to the following basic conditions:

QUALITY POINT AVERAGE

The graduation requirement is a cumulative average of 1.80. (Beginning with the Class of 1972, the required aver-

age is 2.00.) A transfer or returning student must satisfy the cumulative quality point average of the class to which he is assigned.

ACCUMULATED CREDITS

- A. The successful completion of at least 120 semester hours of academic credit. Individual colleges, schools, divisions and departments may require more than 120 semester hours of academic credit. These are exclusive of required physical education courses.

CORE CURRICULUM REQUIREMENTS

In addition to the requirements for all students listed below, each school or college and major program has additional requirements to be found in other parts of this catalog.

- B. An introduction to the basic skills of communication by successful completion of English 111 and 112 and Speech 101, 105, 107, or 150.
- C. An introduction to the humanities by the successful completion of a year's study of literature in the Western Tradition and one of the elective courses (of at least 3 credits) identified by the letter "C" in the University catalog.
- D. An introduction to the social and behavioral sciences by the successful completion of three courses (of at least 3 credits each) chosen from those identified by the letter "D" in the University catalog; and from at least two departments.
- E. An introduction to mathematics and the natural sciences by the successful completion of at least four courses (each of at least 3 credits) chosen from those identified by the letter "E" in the University catalog, and from at least two of these groups: A) logic, mathematics and statistics; B) botany, entomology, microbiology and zoology, and C) astronomy, chemistry, geology and physics.
- F. Intensive or specialized work in a particular department, division, school or college constituting a major and consisting of the successful completion of at least fifteen semester hours of credit in junior-senior courses in the area of the major.

A basic physical education course of two semesters' duration is required of all students. The course is PE 100 and carries one credit per semester. A transfer student awarded 15 or more transfer credits must complete the physical education semesters of the class to which he is

assigned (i.e. a transfer student given 15 transfer credits must complete one semester of physical education). A transfer entering with an Associate Degree from an accredited institution is exempt from physical education. Students who originally enroll in this University, subsequently transferring in work from other institutions, may be awarded physical education waivers congruent with those given to transfer students.

Military training may be elected on a voluntary basis. All military training carries graduation credit.

HONORS

- A. *University Honors Groups.* At the beginning of each semester a list is posted of those students who, during the previous semester, attained a semester grade point average of 3.0 or higher. Three groups are recognized:

First Honors . . . 3.8 (3.75) or higher

Second Honors 3.4 (3.35) to 3.7 (3.74) inclusive

Third Honors . . . 3.0 (2.95) to 3.3 (3.34) inclusive

- B. *Graduation with Distinction.* High ranking students will be graduated as follows:

Summa Cum Laude—Cumulative average 3.80 or higher.

Magna Cum Laude—Cumulative average 3.40 to 3.79 inclusive.

Cum Laude—Cumulative average 3.00 to 3.39 inclusive.

A transfer student must have earned his final 60 semester hours of credit in residence at the University to be eligible for graduation with distinction.

Reports and Transcripts

- A. *Mid-Semester Report:*
In the fall mid-semester reports for first-semester freshmen and transfer students are given to students by advisers and also sent home. No mid-semester reports are prepared for other classes.
- B. *Final Grades:*
Fall semester: distributed to students at registration and mailed to parents.
Spring semester: mailed to homes.
Summer semester: one report printed at end of summer for all summer courses. Distributed to students at fall registration or mailed home.

Two transcripts of a student's record will be furnished without cost by the Registrar's Office. For each additional copy there will be a charge of \$1. No transcript is issued

without the student's written request. A partial transcript is never issued.

General Requirements

RESIDENCE

It is the policy of the University that the final year's scholastic work be taken in residence, which is defined for this purpose as continuous enrollment and regular attendance in classes conducted on the campus of the University. This requirement may be waived by the Board of Admissions and Records upon recommendations of the major department and Dean of the college or school. Such approval should be obtained in advance of completing the degree *in absentia*. The Board may also waive the requirement for a student admitted to an appropriate professional school after completion of six or more semesters of work at the University, provided:

1. That the cumulative average at the University is 2.5 or higher.
2. That satisfactory evidence is presented indicating completion of work comparable to that offered at the University in amount sufficient to satisfy requirements for the appropriate bachelor's degree.
3. That the major department and Dean of the College or School approve.

No student is allowed more than ten semesters, including semesters at other colleges, to attain the required graduation average. Twelve accumulated semester credits earned in summer schools at the University or other colleges constitutes a semester. A student who maintains the required graduation average but is deficient in course requirements may continue enrollment until his course requirements are completed.

A student must earn a minimum of 45 credits in residence to be considered for the baccalaureate degree.

A student will be dismissed for academic deficiency at the end of seven, eight, or nine semesters if he has failed to satisfy the cutting point requirements of his class set for the seventh semester. A student so dismissed may apply for readmission under the usual conditions.

DINING

All freshmen, sophomores and juniors residing in University residence halls will be required to board at University dining halls except that such students who are members of fraternities or sororities may be permitted to board at their respective fraternities or sororities by permission of the appropriate student personnel dean. University board is optional for seniors and is available on a cash basis.

PAYMENTS DUE

Diplomas, transcripts of record, and letters of honorable dismissal will be withheld from all students who have not paid all bills and all loans due the University. All such bills due the University must be paid ten days preceding Commencement. If paid after that date and the student is otherwise eligible, he may graduate the following year.

Registration

PRE-REGISTRATION

Every student must pre-register during the designated period. Students who pre-register late will be charged a fee of \$5. A student who does not pre-register will forfeit his option to register for the following semester and must submit an application for readmission (within the stated deadlines) before being allowed to register again.

LATE REGISTRATION

Each student must report for registration on the appointed day. Late registrants must pay a \$5 fine.

COURSE REGISTRATION

No course will be recorded on the permanent records of the University nor will a student receive credit for it unless he has registered for such a course in accordance with established procedure on a regularly scheduled registration day or unless his registration shall have been made official by a Program Change Card filed with the Registrar.

No instructor should allow a student to enter his class unless the student was officially enrolled on a regularly scheduled registration day or has submitted a Program Change Card authorizing his admission to the class. A course dropped without the approval of the Registrar will be treated as a Failure.

Course Enrollment and Withdrawals

A. General Regulations

1. Course Loads

The normal credit load is at least 15 credits. Regular students will carry a minimum of 12 credits (freshmen, 11). The maximum semester credit load is established by the appropriate school or college. Only students of high academic standing (cumulative averages of 2.5 and above) will be permitted to take an overload of one course with the approval of the academic dean involved and of two courses with the approval of the Dean and the Provost.

Approval forms are available in the Office of the Registrar. Seniors in their final two semesters may carry an overload of one course each semester without special permission if such an overload will enable them to graduate, or an overload of two courses each semester with the approval of the academic dean. Seniors needing six or more courses totaling at least 18 credits to graduate may elect to distribute their course load over their final two semesters. Under this arrangement, reduced load permission is not required to carry less than 12 credits.

2. Certification of Course Changes

To add, drop, or change a course, the student must obtain the signature of the instructors concerned, the faculty adviser (if required by his major department), and the appropriate officer in the Registrar's Office. Signed cards are to be filed with the Registrar. Instructors and advisers are referred to the Manual for Faculty Advisers for specific information.

3. Exceptions to the Regulations

Exceptions to these regulations are made only in cases of protracted illness, critical personal or academic problems, and then only with the approval of the student's Academic Dean based upon recommendation of the appropriate one of the following: Health Service, Deans of Men, Women, or Students, or Counseling and Guidance Office.

B. Course Registration Changes

ADD PERIOD—Within the period of up to and including ten academic days from the beginning of a semester a student may add, drop, or substitute a course without notation on his record. Monday through Saturday are defined as full academic days. No courses may be added after this period.

W PERIOD—Within the period of the 11th academic day and up to and including 28 academic days from the beginning of a semester a student may drop a course subject to the minimum load regulation above; the notation of withdrawal on his record as a W is the only record. The W period is extended to six academic days beyond the closing date for mid-semester grades (printed in the University Calendar) for the first semester freshmen, first semester transfers, and interchange students from the University at Boston.

WF PERIOD—After the 28th academic day and subject to general regulations above, a student may not drop a course without having a WF entered on his record at the time of withdrawal. This grade is figured in the cumulative average.

C. Withdrawal from the University

Prior to the closing date for mid-semester grades, when a student withdraws from the University, grades of W will be noted on his record. The portion of the semester will not count as one of the ten semesters permitted toward attaining the graduation average.

After the closing date for mid-semester grades, grades of WF or WP will be entered, as appropriate, for all courses in which the student is enrolled. The WF's will count in the cumulative average. The semester will count as one of the ten semesters permitted for attaining the graduation average.

CHANGE OF MAJOR

A student wishing to change his major must get a Major Change Card at the Registrar's Office. This change is to be approved by the head of the department or school in which he is now majoring and also by his new major adviser. This card, properly endorsed, must be returned to the Registrar's Office before the change receives final approval. As part of the major change procedure, the student takes his Academic Records Folder to the new department.

Classification of Undergraduate Part-Time Students

1. Degree Students

FULL TIME STUDENTS

All students carrying 12 (freshmen, 11) or more credits must be accepted as degree candidates and assigned to a graduating class.

REDUCED LOAD STUDENTS

Full time students may obtain exemption from the minimum load requirements set by the Faculty Senate only upon approval of their academic dean based upon recommendation of the appropriate one of the following: Health Service, Deans of Men, Women, or Students, or Counseling and Guidance Office. Such exemption is ordinarily not granted except upon the basis of health or critical personal or academic problems. A regular student may not enter the non-classified degree category (below).

Reduced load students are considered as full time students in *all* benefits, fees, and obligation. They continue in a class designation. The only exception made in their case is to the minimum load regulation. Although reduced load students carry less than the minimum load, the appropriate semester and cumulative quality point requirements for retention do apply and the semester counts as one of the ten towards graduation. Reduced load students bear a regular Student I.D. card.

NON-CLASSIFIED DEGREE STUDENTS

Students who are admitted to degree status on the same basis as full time students, but with the expectation of only part time pursuit of the degree are considered *Non-classified Students*. They are given a classification of "NC." For their initial enrollment they are processed as incoming freshmen or transfer students. They are assigned to a major department, to provide appropriate counseling and pre-registration advising.

Non-Classified students are not entitled to student benefits, other than departmental support. They are billed by the credit with other fees assessed only as appropriate to Special Students (below). At pre-registration a special billing card is filled out by student and adviser. To be eligible for continued enrollment, non-classified students must maintain a cumulative average equal to the graduation average of the University. They bear a Special Student I.D. card.

The category "Non-Classified" is an original admissions category and is not designed as a category into which full-time students may revert for purposes of part-time study.

2. Non-Degree Students

SPECIAL STUDENTS

A transient student accepted for one or two courses on a *non-continuing* basis is assigned to this category (Class designation "SP"). No evaluation of transfer credentials or course advising is offered to students in this category nor are they entitled to any student benefits. Their continuance is not automatic, but at the discretion of the appropriate admissions officer. A minimum of the graduation average of the University would be required for an "SP" to continue. They bear a Special Student I.D. card.

Special Course Registration

ADVANCED PLACEMENT

If a student is given advanced placement by a placement examination or by some other means, he will be given credit but no grade for the omitted work. He will be considered to have completed any requirement represented

by the omitted work. Credit without grade awarded in this manner will be treated as transfer credit and not computed in quality-point averages.

AUDITING

A full-time undergraduate student may audit a course by presenting his I.D. card to the instructor of the course, provided that the instructor can accommodate the auditor in his class, believes that the student has sound academic reasons for the audit and has the proper preparation. The student will be expected to pay laboratory fees, where applicable. The audited course is not represented in any way on the student's permanent record.

CREDIT BY SPECIAL EXAMINATION

The requirements of any course approved for credit may be met by examination upon arrangement with the dean of the school or college and the head of the department offering the course, provided the student's quality point average is 2.5 or higher. All such arrangements must be completed prior to the mid-semester. No student may earn more than 30 credits in this manner. Grades and credits of courses taken by examination are included in the quality point average calculations.

CREDIT FOR WORK COMPLETED AT FOREIGN INSTITUTIONS OR IN MILITARY SERVICE

Students seeking credit for work taken at foreign colleges or for service-connected educational experiences must apply to the Registrar. Frequently credit may not be granted for such work without approval of the department concerned. No student will automatically receive credit for any specific course. Each case must be decided according to appropriate criteria.

Five College Courses

Amherst, Mount Holyoke and Smith Colleges and newly formed Hampshire College and the University of Massachusetts combine their academic activities in selected areas for the purpose of extending and enriching their collective educational resources. Certain specialized courses not ordinarily available at the undergraduate level are operated jointly and open to all. In addition, a student in good standing at any of the institutions may take a course without cost to the student, at any of the others if the course is not available to him on his own campus and he has the necessary qualifications. The course must have a bearing on the educational plan arranged by the student and his adviser. Approvals of the student's adviser and the Academic Dean of the College (Provost at the University) at the home institution are required. Permission of the in-

structor is required for students from other campuses if permission is required for students of the institution at which the course is offered.

Students should apply for interchange courses at least six weeks prior to the beginning of the semester since they may find some courses already filled after that time. Free bus transportation among the five institutions is available for interchange students.

Students interested in such courses will find current catalogs of the other institutions and the University's Summer Session in departmental offices, the University library or the Office of the Registrar. Applications may be obtained from the Office of the Provost.

FREIBURG PROGRAM

In cooperation with the University of Freiburg, Germany, the University of Massachusetts operates a year-long Freiburg Program. The University of Massachusetts has a permanent facility in Freiburg, the Atlantic Studies Institute, which serves as the headquarters of the Freiburg Program. Students enrolled in the Program are regularly enrolled students of the University of Freiburg, and take courses in a wide range of social science and humanities courses. The Freiburg Program is not restricted to students concentrating in German only, but admits students in philosophy, music, English, history, comparative literature and other fields.

Enrollment is limited to graduate students and **superior upper division undergraduates with fluency in German**. Students enrolled in other American colleges and universities may also apply. Candidates are expected to enroll in a special preparatory course and seminar which is offered in the spring semester, unless excused on the basis of language proficiency.

Cost for the two semesters in Freiburg, including transportation, is approximately equal to that of an academic year on the University campus.

CREDIT FOR STUDY ABROAD OR IN MILITARY SERVICE

Students wishing credit for academic study abroad must receive approval of the program they intend to follow abroad before they go overseas. Prior Approval Forms may be obtained at the Registrar's Office. All students must receive approval for their departmental adviser. Students in the College of Arts and Sciences must also receive approval from the Director of International Programs. Students in other schools and colleges must obtain the approval of the dean of their school or college. This procedure helps to ensure that on re-enrolling in the University of Massachusetts the student will be granted credit for his study overseas. Students seeking credit for Educational experiences connected with military service should consult the Registrar's Office.

Directory of Courses

This Directory lists offerings available in each college, school, division, and department. Students should consult the index for the general fields under which specific courses may be found.

SUMMARY OF THE COURSE NUMBERING SYSTEM:

- 000-099 Non-credit courses with no quality-point value toward graduation (such as courses needed to make up entrance deficiencies).
- 100-199 Undergraduate credit only: freshman-sophomore level.
- 200-399 Undergraduate credit only: junior-senior level.
- 400-499 Professional courses open to students having the bachelor's degree.
- 500-699 Courses available for graduate credit.
- 700-999 Graduate level courses.

Under normal circumstances, undergraduate students will be concerned only with courses numbered below 400.

Students interested in the University's program of graduate studies should consult the Graduate School Bulletin.

The following numbers are assigned to special courses and academic activities:

- 195-199 Honors Colloquia, Lower Division
395-398 Honors Colloquia, Upper Division
399 Departmental Honors
390-394 Seminars, Undergraduate
385-389 Special Problems, Undergraduate
700 Special Problems, Graduate
800 Master's Thesis
900 Doctoral Dissertation

Roman numerals indicate the semester(s) in which a course is given.

Capital letters appearing in parentheses after course titles designate various categories of courses required for graduation. For a full explanation of graduation requirements, see Page 8.

College of Agriculture

ARLESS A. SPIELMAN, *Dean*

Fred P. Jeffrey, *Associate Dean*

Ernest M. Buck, *Assistant Dean*

Agricultural and Food Economics

Head of Department: Professor J. B. Wyckoff. Professors Brown, Crossmon, Leed; Associate Professors Bragg, Christensen, Engel, Fitzpatrick, Foster, Fuller, Jarvesoo, Russell, Storey; Assistant Professors Callahan, Lee, Marion, Spindler, Vertrees.

Majors will satisfy University and departmental graduation requirements as follows: 9 credits in humanities and fine arts, 6 credits in communication subjects, 6 credits in mathematics, 6 credits in natural sciences, 12 credits in economics, 6 credits in other social sciences, 6 credits in business courses, 3 credits in statistics, 12 credits in technical offerings of the College of Agriculture appropriate to the special interest of the student in resource economics, agricultural economics, or food economics; and 15 credits in the major field.

Thirty-six credits in electives are available to be used in a program consistent with the student's major interest as developed with the adviser. It should be noted that

majors in this department will take 6 credits in social sciences in lieu of 6 credits in natural sciences required of other majors in the College of Agriculture.

110 (I). FOOD AND NATURAL RESOURCES.

Introduction to the natural, economic, and socio-political forces influencing world food and biological resource use; world resource problems including population growth, inadequate production resource ownership and management and international trade. 2 class hours. 1 2-hour discussion section.

Credit, 3. Mr. Foster.

206 (II). AGRICULTURAL ECONOMICS.

Intensive review of the agricultural sector. Application of economic principles to problems of production and marketing, elements of price making. Income problems of agriculture. 3 class hours.

Credit, 3. Mr. Fitzpatrick.

235 (I). AGRICULTURAL BUSINESS MANAGEMENT.

Decision-making principles, management tools, analytical methods and their application to management problems of commercial farms and other agricultural firms. 2 class hours, 1 2-hour discussion.

Credit, 3. Mr. Lee.

261 (I). **FOOD MARKETING SYSTEMS.**

Structure of food marketing systems. Operating principles, significant product characteristics, role of specialized marketing firms, government programs and policies. 3 class hours.

Credit, 3. Mr. Fitzpatrick.

265 (I). **FOOD MERCHANDISING.**

Economic analysis of factors, internal and external to the firm, influencing sales of food firms. Food industry development, consumer behavior, competitive strategies, and legal considerations. 3 class hours.

Credit, 3. Mr. Marion.

341 (I). **PRICE THEORY AND ANALYSIS.**

A study of price theory and the analytic tools of economic analysis. Emphasis is placed on the application of quantitative techniques in the analysis of practical economic problems. Material is related to managerial decision making. 3 class hours.

Credit, 3. Mr. Christensen.

352 (I). **AGRICULTURAL POLICY.**

Analysis of farm price support programs, programs for alleviation of rural poverty, food trade and aid policies, other topical issues. 3 class hours.

Credit, 3. Mr. Storey.

368 (II). **FOOD DISTRIBUTION ECONOMICS.**

A critical analysis of the food industry; the legal and competitive framework; performance and public policy; management practices with respect to site selection, budgeting, merchandising, expense control and employee training and evaluation in food distribution firms. 3 class hours.

Credit, 3. Mr. Light.

373 (II). **RESOURCE AND CONSERVATION ECONOMICS.**

Economic and institutional factors affecting land and water use. Land use planning. Elements of conservation economics. 3 class hours.

Credit, 3. Mr. Foster.

381 (II). **INTERNATIONAL AGRICULTURAL DEVELOPMENT.**

Economic development of low income rural economies. Relation of agriculture to national economies. Exogenous and endogenous factors in development. 3 class hours.

Credit, 3. Mr. Foster.

385 (I). **SPECIAL PROBLEMS IN AGRICULTURAL ECONOMICS.**

Credit, 1. Staff.

386 (II). **SPECIAL PROBLEMS IN FOOD ECONOMICS.**

Credit, 1-3. Staff.

387 (II). **SPECIAL PROBLEMS IN RESOURCE ECONOMICS.**

Credit, 1-3. Staff.

399 (I & II). **DEPARTMENTAL HONORS.**

Honors thesis work. Prerequisite, consent of Departmental Honors Committee.

Credit, 6. Staff.

Agricultural Engineering

Head of Department: Professor J. T. Clayton, Professors Fitzgerald, Zahradnik; Associate Professors C. Johnson Light, Norton, Whitney; Assistant Professors Chen, E. Johnson, Pira, Rha; Instructor Fletcher.

261 (I). **HOUSE PLANNING.**

Space arrangement, construction materials, construction problems and discussion, utilities, financing, maintenance, and remodeling. Emphasis on planning and evaluation procedures and factors. 1 class hour, 2 2-hour laboratory periods.

Credit, 3. Mr. C. Johnson

281 (I). **FUNDAMENTALS OF FOOD SERVICE SYSTEMS ENGINEERING.**

The fundamental engineering principles involved in the planning, equipping and operation of a commercial restaurant. Emphasis on application of these principles to specific situations within the kitchen. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Mr. Fletcher.

356 (II). **CONTROL SYSTEMS FOR SOIL MOISTURE.**

Design of systems for soil drainage and crop irrigation. Study of soil requirements, climatology and hydraulics as applied to engineering problems involved in these systems. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Mr. E. Johnson.

361 (I). **STRUCTURES AND RELATED EQUIPMENT.**

Fundamental aspects of planning modern farm structures with emphasis on design, environmental control and integration of mechanical equipment. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Mr. Light.

376 (II). **MECHANIZATION IN CROP PRODUCTION.**

Principles of operation, maintenance, and selection of farm tractors and field machinery; irrigation and drainage systems and equipment. Emphasis on management practices and discussions. 1 class hour, 2 2-hour laboratory periods.

Credit, 3. Mr. Whitney.

381 (I). **ELEMENTS OF PROCESS ENGINEERING.**

The fundamental engineering principles involved in the processing of biological materials with emphasis on heat transfer, mass and energy balances, refrigeration, psychrometry, properties of fluids and fluid flow. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Mr. Fletcher.

386 (II). **UNIT OPERATIONS IN FOOD ENGINEERING.**

Application of engineering concepts to the processing and handling of biological materials, including evaporation, dehydration, irradiation, freeze drying, cost analysis, material handling, manual motion economy and packaging. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Mr. Fletcher.

387 (I) 388 (II). **SPECIAL PROBLEMS**

Supervised individual work on assigned problems or projects. For qualified upperclassmen.

Credit, 1-3. Staff.

390. (I). **INSTRUMENTATION.**

Study of instrumentation applied to research, covering recorders, indicators, controllers and transducers in general. Emphasis on applications and limitations. Prerequisite, Physics 104 or equivalent. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Mr. E. Johnson.

Entomology

Head of Department: Associate Professor T. Michael Peters. Professors Hanson, Lilly, Shaw; Associate Professors Becker, Smith; Assistant Professors Edwards, Jensen, Stoffolano.

For students anticipating research or teaching careers which require graduate study, electives should stress basic sciences and liberal arts courses in botany, chemistry, English, modern languages, statistics, and zoology. Students interested in medical entomology should include microbiology, parasitology, and public health courses. For work in pest control, extension, quarantines, or agricultural chemicals, electives from plant pathology and plant and soil sciences, forestry, business, speech, and applied entomology are recommended.

126 (I), (II). GENERAL ENTOMOLOGY (E).

A survey of the entire field of entomology; structure, development, evolution, classification, biology, and natural control of insects. Formation of an insect collection. 2 class hours, 1 3-hour laboratory period. *Credit, 3. Mr. Peters.*

150 (I). PRINCIPLES OF APPLIED ENTOMOLOGY.

A broad basic course for both majors and non-majors. General principles of pest control are stressed instead of "how-to-do-it" details. 2 class hours, 1 2-hour laboratory period. *Credit, 3. Mr. Lilly.*

260 (II). FOOD AND STRUCTURAL PESTS.

Identification, biology and specific control measures of arthropod and rodent pests in structures, foods, fabrics, and miscellaneous products during transportation and in homes. A prior course in zoology or entomology desirable. 2 class hours, 1 2-hour laboratory period. *Credit, 3. Mr. Lilly.*

266 (II). PRINCIPLES OF APICULTURE.

Honeybees and their relatives, structure and biology of bees, methods of management, diseases, pollination, queen rearing, honey production, and history of beekeeping. Given in alternate years. Prerequisite, Entomology 126, or permission of instructor. 2 class hours, 1 2-hour laboratory period. *Credit, 3.*

272 (II). FOREST AND SHADE TREE INSECTS.

The principles and methods of controlling insects which attack trees and forest products. A study of important species, their identification, biology, and specific control measures. 2 class hours, 2 2-hour laboratory periods. *Credit, 4. Mr. Becker.*

279 (I). ANIMAL ECOLOGY.

Relations of animals to their physical and biotic environment, with observations and quantitative measurement of these factors and responses in the field and laboratory. Prerequisite, a course in entomology or zoology. 2 class hours, 1 2-hour laboratory period. *Credit, 3. Mr. Stoffolano.*

290 (I), (II). EVOLUTION.

The course and dynamics of both inorganic and organic evolution are treated, as are the implications of evolutionary concept on human philosophy, behavior and welfare. 3 class hours. *Credit, 3. Mr. Hanson.*

355 (I), 356 (II). CLASSIFICATION OF INSECTS (1971-72).

The identification of insects, including immature stages. First semester: Orthoptera, Hemiptera, Coleoptera; Second Semester: other orders. Either semester may be elected independently. Given in alternate years. Prerequisite, permission of instructor; Entomology 126 desired. 3 2-hour laboratory periods. *Credit, 3. Miss Smith.*

357 (I). INSECT MORPHOLOGY (1970-71)

The external anatomy of the major orders, with stress on phylogenetic relationships, as background for subsequent work in taxonomy and physiology. Given in alternate years. Prerequisite, permission of instructor; Entomology 126 desired. 1 class hour, 3 2-hour laboratory periods. *Credit, 4. Mr. Hanson.*

374 (II). MEDICAL AND VETERINARY ENTOMOLOGY (1971-72).

Relationships of insects and their allies to the health of man and animals. The classification, biology and control of these pests. Given in alternate years. Prerequisite, Entomology 126 or permission of instructor. 1 class hour, 2 2-hour laboratory periods. *Credit, 3.*

380 (II). INSECT CONTROL (1971-72).

The science of pest control. Biological control and the need, economics, effectiveness, and hazards of insecticides are emphasized. Given in alternate years. Prerequisite, Entomology 150; 279, and 382 desirable. 1 class hour, 2 2-hour laboratory periods. *Credit, 3.*

381. ECONOMIC ENTOMOLOGY.

Application of the principles of insect pest management with emphasis on past recognition, properties of available control agents and their correct use in planning control programs. Prerequisites, Entomology 680, Entomology 126 desirable or permission of instructor. *Credit, 3.*

382 (II). INSECT PHYSIOLOGY (1970-71).

Detailed consideration of the organ systems, their functions in nutrition, reproduction, respiration, and growth, and the relationship of physiology to behavior. Given in alternate years. Prerequisites, Entomology 126 and permission of instructor. 2 class hours, 2 3-hour laboratory periods. *Credit, 4. Mr. Edwards.*

385 (I), 386 (II). SPECIAL PROBLEMS IN ENTOMOLOGY.

Supervised problem work in entomology, including apiculture, for qualified students. Prerequisites, Entomology 126 and permission of instructor. *Credit, 1-3.*

Environmental Sciences

Head of Department: Professor John A. Naegele. Commonwealth Professor Warren Litsky; Professors Faddoul, Feder, Galinat, Young; Associate Professors Gunner, Mueller; Assistant Professors Campbell, Chater, Craker, Fellows, Gentile, Manning, McEnroe, Walker.

In cooperation with several other departments, the following undergraduate courses are offered:

285. MICROBIOLOGY OF THE SOIL.

(Also listed under Plant and Soil Sciences)

Soil organisms; their distribution, ecology and transformation or organic and inorganic substrates. Microbiology of the rhizosphere and the biological equilibrium. *Credit, 3. Mr. Gunner.*

385 (I), 386 (II). SPECIAL PROBLEMS.

(Under Plant and Soil Sciences, Entomology, Plant Pathology, Public Health). *Credit, 1-3. Staff.*

Food Science and Technology

Head of Department: Professor William B. Esselen. Professors Fageron, Francis, Hankinson, Hayes, Hultin, Stumbo; Associate Professors Buck, Mulvaney, Nawar, Potter, Sawyer; Assistant Professors Clydesdale, Evans, Hunting, Levin.

251 (I). INTRODUCTORY FOOD SCIENCE.

Primarily for department majors. Food manufacture, preservation, processing, and distribution. 3 class hours.

Credit, 3. Mr. Hayes.

258 (II). ANIMAL PRODUCTS.

Principles of preparation and processing of animal and poultry products. Chemical and structural aspects of muscle as they relate to quality evaluation and preservation of meat. 2 class hours, 1 2-hour lecture-demonstration.

Credit, 3. Mr. Buck, Mr. Denison.

275 (I), (II). SURVEY OF FOOD TECHNOLOGY.

For non-Food Science and Technology majors. 2 class hours, 1 2-hour laboratory period. *Credit 3. Mr. Esselen, Mr. Hayes.*

352 (II). FOOD CHEMISTRY.

The chemistry of food products. Chemical and biological changes that occur in foods during storage and processing. Emphasis is placed on a study of changes at the cellular and molecular levels. Prerequisite, biochemistry or concurrent registration. 2 class hours, 1 4-hour laboratory period alternate weeks.

Credit, 3. Mr. Hultin.

361 (II). FOOD PROCESSING.

Introduction to the food industry, principles of processing and preservation in current usage. Statistical quality control procedures. 3 class hours, laboratories by arrangement.

Credit, 3. Mr. Mulvaney.

362 (I). FOOD PROCESSING LABORATORY.

Application and utilization of pilot plant equipment to study and evaluate principles of commercial practice in the food industry. Introduction to advanced techniques of food processing. 1 class hour, 1 4-hour laboratory period. Prerequisite, Food Science 361. *Credit, 3. Mr. Mulvaney.*

365 (I). UNIT OPERATIONS.

Technical principles involved in the processing of food, milk and dairy products. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Mr. Hankinson.

366 (II). QUALITY CONTROL AND STANDARDS.

Relationship of composition, handling, processing, storage and market regulations to the bacteriological and chemical quality of milk and its products. 2 class hours, 2 2-hour laboratory periods.

Credit, 4. Mr. Evans, Mr. Potter.

371 (I). ANALYSIS OF FOOD PRODUCTS.

Physical, chemical, microbiological and microscopical methods. Prerequisite, Analytical Chemistry. 2 class hours. 1 4-hour laboratory period. *Credit, 3. Mr. Hunting.*

372 (II). OBJECTIVE ANALYTICAL METHODS AND INSTRUMENTATION.

Continuation of 371. Prerequisite, Food Science 371. 2 class hours, 1 4-hour laboratory period. *Credit, 3. Mr. Hunting.*

384 (II). SENSORY EVALUATION METHODS.

An introduction to sensory measurements in the evaluation and acceptance of foods. Panel tests and their statistical interpretations; taste, odor, color, and texture measurements. For seniors only. 1 class hour, 1 2-hour laboratory period.

Credit, 2. Mr. Sawyer.

385 (I), 386 (II). SPECIAL PROBLEMS.

Problem work under staff supervision, intended to introduce qualified seniors to research methods in some phase of Dairy or Food Technology. *Credit, 1-3. Staff.*

391 (I), 392 (II). FOOD SCIENCE SEMINAR.

For seniors who major in Food Science and Technology. 2 class hours. *Credit, 2. Staff.*

Forestry and Wildlife Management

Head of Department: Professor Arnold D. Rhodes. Professors Gatslick, MacConnell; Associate Professors Abbott, Bond, Carlozzi, C. F. Cole, Greeley, Larson, Mader, McCann, Reed, Rice; Assistant Professors, Hoadley, McNamara, Wilson; Instructors, A. B. Cole, Mawson.

FORESTRY

112 (II). DENDROLOGY.

The taxonomic features, silvical characteristics, and distribution of the principal tree species of temperate North America; a description of the forests where they occur. Prerequisite, Botany 100. 2 class hours, 2 2-hour laboratory periods.

Credit, 3. Mr. Abbott, Mr. A. B. Cole.

121 (Summer). **TIMBER HARVESTING.**

Timber harvesting and primary conversion of wood products; field trip of one-week duration to observe these processes in major wood-using industries. 3 40-hour weeks.

Credit, 3. Mr. A. B. Cole, Mr. Bond.

222 (Summer). **CONSERVATION OF NATURAL RESOURCES.**

Conservation principles and their application to problems in soils, water, forests, wildlife, mineral and general landscape resources; relationship of conservation to national development.

Credit, 3. Mr. Carlozzi or Mr. Greeley.

223 (I). **SILVICS.**

Forest ecology as a foundation for silviculture, watershed management, wildlife management, and forest recreation; environmental factors; development of trees and forest communities; forest influences. 2 class hours, 1 4-hour laboratory period.

Credit, 3. Mr. Mader, Mr. Wilson.

224 (II). **FOREST SOILS.**

Effects of soil properties on tree growth; relationship of soils to silviculture, harvesting, watersheds, wildlife, and forest recreation; forest soil description, classification, and mapping. 2 class hours, 1 4-hour laboratory period.

Credit, 3. Mr. Mader.

225 (I) and (Summer). **THE ELEMENTS OF FOREST MENSURATION.**

The measurement of trees, stands, and forest products; field-office practice in timber estimating and log scaling; collection and compilation of forest inventory data. 2 class hours, 1 4-hour laboratory period. Summer course, 3 40-hour weeks.

Credit, 3. Mr. Mawson, Mr. MacConnell.

226 (II). **THE PRINCIPLES OF SILVICULTURE.**

Culture of forest crops: regeneration and intermediate cuttings, silviculture, slash disposal; planting, direct seeding, nursery management; interactions with forest management for water, wildlife, and recreation. Prerequisite, Forestry 223 recommended. 3 class hours, 1 4-hour laboratory period.

Credit, 4. Mr. Rhodes, Mr. Abbott.

227 (II). **TREE PHYSIOLOGY.**

Growth and development during the life cycle of trees, emphasizing the whole-plant approach and phenomena best studied in trees; the physiological basis of silviculture. Prerequisite, Botany 211 or equivalent. 2 class hours, 1 3-hr. laboratory period.

Credit, 3. Mr. Wilson.

229 (I). **FOREST PROTECTION.**

Principles of protecting forests from fire, insects, disease, domestic animals, wildlife, and atmospheric agencies with special emphasis on the prevention and control of forest fires. 3 class hours.

Credit, 3. Mr. Abbott.

231 (I). **AERIAL PHOTOGRAMMETRY.**

The application of photogrammetry in forest management, wildlife biology, and other fields concerned with large land surfaces; photographic interpretation and map making from aerial photographs. 2 class hours, 1 4-hour laboratory period.

Credit, 3. Mr. MacConnell.

232 (II). **FOREST TREE IMPROVEMENT.**

Tree introduction, geographic variation, tree selection, vegeta-

tive propagation, controlled pollination and hybridization, seed orchard management. Prerequisite, Forestry 112. 2 class hours, 1 4-hour laboratory period.

Credit, 3. Mr. Abbott.

234 (II). **ADVANCED FOREST MENSURATION.**

The analysis of growth and yield in forest stands; construction of standard volume tables and yield tables; plotless cruising and continuous forest inventory. Prerequisite, Forestry 225. 2 class hours, 1 4-hour laboratory period.

Credit, 3. Mr. Mawson.

235 (I). **FORESTRY ECONOMICS.**

The application of economic principles to the allocation of land, labor, and capital in forest enterprises; marketing and pricing theory of forest crops. Prerequisite, Economics 125. 3 class hours.

Credit, 3. Mr. Bond.

236 (II). **FOREST RESOURCES POLICY.**

Forest policy in the United States: history of policy development; factors affecting forest resources management; forest taxation, credit, insurance, and resource planning. 2 class hours and 1 2-hour seminar.

Credit, 3. Mr. Bond.

240 (II). **PRINCIPLES OF FOREST MANAGEMENT.**

Multiple-use management of forest land for wood, water, wildlife, and recreation; organization of the forest for sustained-yield management; preparation of management plans. Prerequisite for the laboratory, Forestry 225. 3 class hours, 1 4-hour laboratory period. Laboratory period optional for non-forestry majors.

Credit, 5 or 3 (lectures only). Mr. MacConnell, Mr. Mawson.

302 (II). **ECOLOGICAL PRINCIPLES OF RESOURCE PLANNING.**

Analysis of ecological principles and their relationship and importance to resource planning. State and federal conservation programs will be chosen for critical case study. Prerequisite, permission of instructor. 3 class hours.

Credit, 3. Mr. Carlozzi.

385 (I), 386 (II). **SPECIAL PROBLEMS IN FORESTRY.**

Individual work on an assigned problem or project in forestry. For qualified upperclassmen. Total credits for two semesters not to exceed 6.

Credit, 2-4. Staff.

391 (I), 392 (II). **FORESTRY SEMINAR.**

Specialized study in a selected area of forestry. For seniors only.

Credit, 3. Staff.

WOOD TECHNOLOGY

201 (I). **WOOD ANATOMY AND IDENTIFICATION.**

A basic anatomical study of wood elements, their various structural characteristics and function; identification of woods. Prerequisite, Botany 100. 2 class hours, 1 3-hour laboratory period.

Credit, 3. Mr. Hoadley.

202 (II). **PRIMARY TIMBER CONVERSION (1970-71).**

Survey of operations, principally sawmilling, in the primary conversion of logs into lumber and allied by-products; drying, grading, handling and market distribution of sawmill products. Not open to students in Forest Management except by special permission. In alternate years. 3 class hours; 1 all-day field trip by arrangement.

Credit, 3. Mr. Rice.

203 (I). FOREST PRODUCTS.

A survey of the principal forest products, their manufacture and distribution. 3 class hours. *Credit, 3. Mr. Gatslick.*

204 (II). PROPERTIES OF WOOD (1970-71).

The physical and mechanical properties of wood and their importance in wood utilization. Techniques for physical measurement and mechanical testing. Prerequisite, Wood Technology 201. In alternate years. 2 class hours, 1 3-hour laboratory period. *Credit, 3. Mr. Hoadley.*

206 (II). WOOD MACHINING TECHNOLOGY (1971-72).

Fundamental principles of knife and saw-tooth action as applied to problems of severing, surfacing, and shaping; general survey of commercial wood machining equipment. Prerequisites, Wood Technology 201 and 204. In alternate years. 2 class hours, 1 3-hour laboratory period. *Credit, 3. Mr. Rice.*

208 (I). WOOD SEASONING AND PRESERVATION (1970-71). Properties of wood in relation to drying and preservation; theory and practice of air seasoning, kiln drying, and preservative treatment. Prerequisite, Wood Technology 204 recommended. In alternate years. 2 class hours, 1 3-hour laboratory period. *Credit, 3. Mr. Rice.*

211 (I). WOOD ADHESIVE TECHNOLOGY (1971-72).

Basic concepts, theories, and applied techniques of gluing wood and fibrous composites. Prerequisites, Wood Technology 201 and 204, Organic Chemistry recommended. 2 class hours, 1 3-hour laboratory. *Credit, 3. Mr. McNamara.*

212 (II). WOOD COATING TECHNOLOGY (1971-72).

Basic concepts and applied techniques in wood substrate surface modification, including materials and methods for finishing wood and fibrous composites. Prerequisites, Wood Technology 201 and 204, Organic Chemistry recommended. 2 class hours, 1 3-hour laboratory period. *Credit, 3. Mr. Gatslick.*

238 (II). WOOD CHEMISTRY (1971-72).

An introduction to the chemistry and surface phenomena of the principal products found in wood. Prerequisite, Organic Chemistry. 3 class hours. *Credit, 3. Mr. McNamara.*

387 (I), 388 (II). SPECIAL PROBLEMS IN WOOD TECHNOLOGY.

Individual work on an assigned problem or project in wood utilization and technology. For qualified upperclassmen. Total credits for two semesters not to exceed 6. *Credit, 2-4. Staff.*

391 (I), 392 (II). WOOD TECHNOLOGY SEMINAR.

Specialized study in a selected area of wood utilization and technology. For upperclassmen only. *Credit, 3. Staff.*

WILDLIFE AND FISHERIES BIOLOGY

The first professional degree in Wildlife and Fisheries Biology is the master's degree; for this reason study toward the bachelor's degree should be regarded as a pre-professional program. Students who do not plan to enter graduate school are urged to meet with their advisers to select electives and plan their course of study accordingly.

WILDLIFE BIOLOGY

261 (I). PRINCIPLES OF WILDLIFE MANAGEMENT.

Fundamental ecology and principles of wildlife management with emphasis on population characteristics and responses. 2 class hours, 1 4-hour laboratory period. *Credit, 3. Mr. Greeley.*

262 (II). TECHNIQUES OF WILDLIFE MANAGEMENT.

Methods of collecting and interpreting data in wildlife management with emphasis on field and laboratory experience in census methods and criteria for determining sex, age and other characteristics of wild birds and mammals. 2 class hours, 1 4-hour laboratory period. *Credit, 3. Mr. Larson.*

263 (I). MANAGEMENT OF WETLAND WILDLIFE (1970-71).

Life histories, identification, and habitat requirements of waterfowl and marshland furbearing animals; management of wetland habitats. 2 class hours, 1 4-hour laboratory period. *Credit, 3. Mr. Larson.*

264 (II). MANAGEMENT OF UPLAND WILDLIFE (1971-72).

Life histories, identification, and habitat requirements of upland game birds, game mammals, and furbearers; management of upland habitats. 2 class hours, 1 4-hour laboratory period. *Credit, 3. Mr. Greeley.*

385 (I), 386 (II). SPECIAL PROBLEMS IN WILDLIFE MANAGEMENT.

Qualified seniors who have completed most of the wildlife courses may arrange for work on a special problem in a selected phase of wildlife management. Total credits for two semesters may not exceed 6. *Credits, 2-4. Mr. Greeley, Mr. Larson.*

FISHERIES BIOLOGY

265 (I). TECHNIQUES OF FISHERIES BIOLOGY.

Principles and techniques of fishery management, stressing population and growth dynamics, and field procedures. Prerequisite, Zoology 300. 2 class hours, 1 4-hour laboratory. *Credit, 3. Mr. C. F. Cole.*

267 (I). LABORATORY IN PRINCIPLES OF FISHERIES BIOLOGY.

Field techniques in fisheries biology; operation and use of fishery research and management equipment. Laboratory analysis of field-collected data using automatic data processing; manuscript preparation. Concurrent enrollment in Fisheries Biology 265. 1 4-hour laboratory. *Credit, 1. Mr. Reed.*

270 (II). ECOLOGY OF FISHES (1971-72).

Biological responses of fishes to the environment. Aspects of feeding, home range, breeding behavior, and other responses to the environment will be considered. Prerequisites, Fisheries Biology 265 and Zoology 300 or permission of instructor. 2 class hours, 1 4-hour laboratory. *Credit, 3. Mr. C. F. Cole and Mr. Reed.*

272 (II). INTRODUCTION TO MARINE FISHERIES.

Factors affecting world marine fisheries resources and development. Review of selected species of commercial importance and selected world fisheries. Prerequisites, Fisheries Biology 265. 3 class hours, 1 4-hour laboratory. Several overnight field trips

requiring Saturday attendance by arrangement; one oceanic field trip by arrangement. \$10.00 laboratory fee to defray travel expenses. *Credit, 3.* Mr. C. F. Cole.

387 (I), 388 (II). SPECIAL PROBLEMS IN FISHERIES BIOLOGY. Individual work for qualified seniors on an assigned problem or project in the field of fisheries biology. Total credits for two semesters may not exceed 6.

Credit, 2-4. Mr. C. F. Cole, Mr. McCann, Mr. Reed.

Hotel and Restaurant Administration

Head of Department: Professor Donald E. Lundberg, Associate Professor Eshbach; Assistant Professors Conrade, Courmoyer, Wrisley; Lecturers Grinnan, Robertson.

Majors in Hotel and Restaurant Administration should take these courses:

FRESHMAN YEAR

First Semester

Introduction	HRA 100
Food and Natural Resources	Ag & Food Ec 110
General Chemistry or Concepts of Physics	Chem 101 or Physics 121

College Algebra	Math 111
English Composition	Engl 111

Guest Lecture

Second Semester

Food Service Management	HRA 101
Oral Communication	Speech 101
English Composition II	Engl 112
General Chemistry II or Concepts of Physics	Chem 102 or Physics 122

Finite Mathematics	Math 112
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SOPHOMORE YEAR

First Semester

Personnel Management in HRA	HRA 102
Introduction to Accounting	Acct 125
Masterpieces of Western Literature	Engl 125
Microbiology or Statistics	Micro 140 or Statistics 121

Guest Lecture Series

Elective

Second Semester

Information Processing for Business or Basic FORTRAN	Acct 100 or Com Sci 121
Food Preparation and Meal Planning	N & F 156
Introduction to Accounting II	Acct 126
Masterpieces of Western Literature	Engl 126

Elective

The following courses are included in the junior and senior years: Elements of Economics, Problems of the National Economy, Hotel and Restaurant Administration, Quantity Food Management, Principles of Food Technology, Industrial Hygiene and Sanitation, Laws of Inn-keeping, Principles of Management, Corporation Finance, Food Preparation and Service, Seminars in Hotel and Restaurant Administration, Animal Products, Hotel Sales and Food Service Facilities Planning. Also required are one humanity course and one course in psychology or sociology. Students may elect a management emphasis or a sales emphasis. Those electing the management emphasis take Management 231 and 371. Those electing the sales emphasis take Speech 101 and Marketing 201, 211, and 222. All students are required to complete at least two summers or its equivalent of on-the-job experience before graduation.

100 (I), (II). INTRODUCTORY.

An introductory course in restaurant and hotel operations. The development of the industry, current trends, and an analysis of the various types of operations that make up the industry.

Credit, 3. Mr. Lundberg.

101 (I). FOOD SERVICE MANAGEMENT.

Practices used by the food service industry pertaining to purchasing, receiving, and issuing food, beverages, and other supplies. Principles of food and beverage cost control. 3 class hours.

Credit, 3. Mr. Wrisley.

102 (I). PERSONNEL MANAGEMENT IN HOTELS AND RESTAURANTS.

The management of people in food services and hotels; leadership and motivation, organization, training, job analysis, and work simplification.

Credit, 3. Mr. Courmoyer.

200 (I). HOTEL AND RESTAURANT ADMINISTRATION.

Financial practices and systems used in hotels and restaurants. Controls, capital budgeting, operational budgeting, use and interpretation of financial statements and specialized hotel accounting procedures. Non-majors require permission of instructor.

Credit, 3. Mr. Wrisley.

201 (II). LAWS OF INNKEEPING.

Laws as applied to hotel and food service establishments; includes a consideration of bailments, torts, regulations, insurance, and sanitation. 3 class hours.

Credit, 3. Mr. Courmoyer.

300 (II). HOTEL AND RESTAURANT MERCHANDISING.

Market environment in which the firm operates; communication principles and their application to sales goals; and effective utilization of techniques and tools of merchandising in hotel, restaurant, and similar enterprises. 3 class hours.

Credit, 3. Mr. Eshbach.

367 (II). FOOD PREPARATION AND SERVICE.

International cookery. Analysis of factors affecting the cooking process. The evaluation of new commercial equipment. 1 class hour, 1 4-hour laboratory period.

Credit, 3. Mr. Robertson.

390 (I), 391 (II). SEMINAR.

Survey or current food service literature and reports. Outside speakers on selected professional topics. 2 class hours.

Credit, 2. Staff.

Landscape Architecture

Head of Department: Professor Ervin H. Zube. Professors Bacon, King, Procopio; Associate Professors Carlozzi, Davis, Mosher; Assistant Professors Cudnohufsky, Dines, Fabos, Hamilton, Kent, Martin; Lecturers Braun Olson, Schwarz, Sears.

ENVIRONMENTAL DESIGN

251 (I), 252 (II). HISTORY AND THEORY.

A broad survey of the history of the designed human environment. 3 class hours.

Credit, 3.

261 (I). BASIC DESIGN.

Principles of 2 and 3 dimensional design and their relationship to the designed human environment. 4 2-hour laboratory periods.

Credit, 4.

262 (II). GRAPHIC COMMUNICATION I.

The theories of projection as related to graphic communication. Prerequisite, E.D. 261. 4 2-hour laboratory periods.

Credit, 4.

351 (I), 352 (II). THEORY.

Theories and techniques relevant to the analysis of design problems. Analysis of functional requirements and ecological factors influencing site development and the consideration of human needs and responses to the designed environment. 3 class hours.

Credit, 3.

361 (I). GRAPHIC COMMUNICATION II.

Study of current techniques used in the graphic communication of the analysis and solution of environmental design problems; and the development of facility in the use of various media. Prerequisite E.D. 262. 3 3-hour laboratory periods.

Credit, 5.

362 (II). APPLIED DESIGN.

The development of an approach embodying the application of theory and design principles to the solution of environmental design problems. Prerequisites E.D. 351 and 361. 3 3-hour laboratory periods.

Credit, 5.

387 (I), 388 (II). SPECIAL PROBLEMS.

Supervised individual work on assigned projects for qualified seniors. Elected only on permission of adviser.

Credit, 1-3.

LANDSCAPE ARCHITECTURE

271 (I), 272 (II). PLANT MATERIALS.

Introduction to trees, shrubs and other plant material useful in landscape plantings. Prerequisite, Botany 100 or 101. 2 3-hour laboratory periods.

Credit, 3 per semester.

371 (I). LAND FORM.

Studies in the manipulation of land surfaces and its graphic representation through topographical plans, cross sections, profiles and models. Prerequisite, E.D. 262. 2 class hours.

Credit, 2.

372 (II). CONSTRUCTION MATERIALS.

Study of the materials used in landscape construction, their design potential and limitations. Prerequisite, E.D. 371. 2 class hours.

Credit, 2.

PLANNING

273 (I), 274 (II). CITY PLANNING.

The historical and legal aspects of land use and regional development, and a critical examination of planning techniques used in guiding the physical growth of communities. 3 class hours.

Credit, 3.

377 (I), 378 (II). URBAN PROBLEMS.

Nature of the planning function in government; and investigation of planning problems in housing, industrial location and development, decentralization of cities, urban transportation, urban design and regional planning. Prerequisite, 274. 2 class hours.

Credit, 2.

PARK ADMINISTRATION

160 (II). HISTORY AND PHILOSOPHY OF PARKS.

A study of the historical, social and economic development of parks. Initial investigation of the philosophy of private, municipal, county, state and national parks. 3 class hours.

Credit, 3.

251 (I). PRINCIPLES OF ARBORICULTURE.

Maintenance of shade and ornamental trees. Development of municipal and private shade tree programs. 2 class hours, 1 2-hour laboratory period.

Credit, 3.

263 (I). PARK ADMINISTRATION.

Analysis of park policies and procedures at the several governmental levels. 2 class hours, 1 2-hour laboratory period.

Credit, 3.

264 (II). PARK MANAGEMENT AND OPERATION.

The principles and purposes of operational and maintenance practices. Selection and adaptability of maintenance equipment by field inspection. 2 class hours, 1 2-hour laboratory period.

Credit, 3.

363 (I). PARK FISCAL AND PERSONNEL MANAGEMENT.

Evaluation of the methods utilized in the preparation, presentation and justification of the financial and personnel requirements of municipal, county, state and national parks. 3 class hours.

Credit, 3.

364 (II). PARK DESIGN.

A series of problems in the physical organization and development of parks. 2 3-hour laboratory periods.

Credit, 3.

RELATED COURSE:

Recreation 361 (I). Introduction to Outdoor Recreation.

Plant Pathology

Head of Department: Professor Richard A. Rohde. Professors Banfield, Gilgut, McKenzie; Associate Professors Agrios, Holmes; Assistant Professor Mount.

251 (I). GENERAL PLANT PATHOLOGY.

The causes, nature and control of plant diseases. Mechanisms, biochemistry and genetics of plant disease induction, development and control. Prerequisite, a course in botany. 2 class hours, 1 3-hour laboratory period. *Credit 3.* Mr. Agrios.

269 (I). FOREST AND SHADE TREE PATHOLOGY.

The nature, cause and control of principal types of disease in trees, including decay of forest products, and of standing and structural timbers. 2 class hours, 1 3-hour laboratory period.

Credit 3. Mr. Banfield.

361 (I). PLANT VIROLOGY (1970-71).

Structure and properties of plant viruses. Virus transmission. Virus infection and synthesis. Symptomatology and physiology of virus infected plants. Assay and purification of plant viruses. Identification and control of plant viruses. Prerequisite. Plant Pathology 251 or permission of instructor.

Credit, 4. Mr. Agrios.

378. NEMATOLOGY. (1971-72).

Anatomy, morphology, and classification of plant-parasitic and other soil-inhabiting nematodes, parasitic relationships with plants and principles of control will be stressed. Alternates with 380. Prerequisite, a year of biological science, 2 class hours, 1 3-hour laboratory period. *Credit, 3.* Mr. Rohde.

380 (II). BIOLOGICAL TRANSMISSION OF PLANT DISEASES.

The intricate interrelationships between insects, plants, microorganisms, and environment are considered in relation to the various roles played by arthropods and other life forms in the inception, transmission and perpetuation of plant diseases. Alternates with 378. Prerequisite, a year of biological science. 3 class hours. *Credit, 3.* Mr. Banfield.

385 (I), 386 (II). SPECIAL PROBLEMS.

Supervised problem work in plant pathology, including nematology, for qualified students. Prerequisites, Plant Pathology 251 and permission of instructor. *Credit, 1-3.* Staff.

Plant and Soil Sciences

Head of Department: Professor F. W. Southwick. Professors Boicourt, Colby, Drake, Havis, Lachman, Thomson, Weeks; Associate Professors Baker, Gunner, Lord, Maynard, Michelson, Stewart, Troll, Vengris, Zak; Assistant Professors Barker, Bramlage, Goddard, Greene, Jennings, Marsh, Rosenau, Tuttle, Yegian; Instructor Anderson.

100 (II). BASIC PLANT SCIENCE.

An introduction to some of the important structural features,

physiological principles, and environmental factors that are related to the growth and development of horticultural crops. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Mr. Jennings, Mr. Maynard, Mr. Anderson.

105 (II). SOILS.

Fundamentals of soil science covering development, properties and management of soils and the interrelationship of soils to plant growth. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Mr. Baker, Mr. Zak.

110 (II). PLANT PROPAGATION.

The science of plant reproduction. 2 class hours, 1 2-hour laboratory period. *Credit, 3.* Mr. Goddard.

200 (I). DECIDUOUS ORCHARD SCIENCE.

The physiological and nutritional principles upon which deciduous tree fruit production is based. Responses of the plants to environmental influences and cultural practices. 2 class hours, 1 2-hour laboratory period. *Credit, 3.* Mr. Anderson.

205 (I). SMALL FRUIT TECHNOLOGY.

Basic principles underlying the production of small fruits. 2 class hours, 1 2-hour laboratory period. *Credit, 3.* Mr. Anderson.

210 (II). RETAIL FLORAL DESIGN.

Basic principles of design as applied to commercial floral arrangements. Non-majors excluded without special permission. 2 3-hour laboratory periods. *Credit, 3.* Mr. Boicourt.

215 (II). FLORICULTURAL SCIENCE.

The science and art of this phase of horticulture for non-majors. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Mr. Boicourt.

220 (II). PHYSIOLOGY OF GREENHOUSE CROPS.

Fundamentals of the artificial environment of greenhouses as they influence the vegetative and reproductive growth of plants. 2 class hours, 1 2-hour laboratory period. *Credit, 3.* Mr. Rosenau.

225 (I). PHYSIOLOGY OF VEGETABLE CROPS.

Factors influencing the growth and culture of vegetable plants. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Mr. Maynard.

230 (I). PLANT NUTRITION.

The accumulation and transport of inorganic ions in plants and their function in plant metabolism. Prerequisite, Botany 211 or equivalent. 2 class hours, 1 3-hour laboratory period.

Credit, 3. Mr. Maynard.

235 (I). TAXONOMY OF ECONOMIC PLANTS.

Plant families, genera, species and cultivars of importance in the horticultural and agronomic fields. 2 class hours, 1 2-hour laboratory period. *Credit, 3.* Mr. Boicourt.

240 (II). PLANT BREEDING.

Improvement of horticultural crops using established genetic principles and methods. Prerequisite, Zoology 240 or equivalent. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Mr. Lachman.

245 (II). POST-HARVEST PHYSIOLOGY.

The physical and chemical processes of plants before and after harvest and the influence of environmental, chemical, and storage factors on these processes. 2 class hours, 1 2-hour laboratory period. *Credit, 3. Mr. Bramlage.*

250 (II). FORAGE AND FIELD CROPS.

Analysis of the principles involved in the establishment, fertilization, and harvest management of forage and field crops. 2 class hours, 1 2-hour laboratory period. *Credit, 3. Mr. Colby.*

255 (I). AGROSTOLOGY.

The establishment and maintenance of turf grasses used on lawns, athletic fields, highways, airports, cemeteries and turf nurseries. 2 class hours, 1 2-hour laboratory period. *Credit, 3. Mr. Troll.*

260 (I). ECOLOGY AND CONTROL OF WEEDS.

Identification and ecology of common weeds and principles of weed control with emphasis on the use of chemical herbicides. 2 class hours, 1 2-hour laboratory period. *Credit, 3. Mr. Vengris.*

265 (I). SOIL FORMATION AND CLASSIFICATION.

The development and classification of soils as related to physical, chemical, biological, climatic and geological factors. 3 class hours, 1 2-hour laboratory period. *Credit, 4. Mr. Weeks.*

270 (II). SOIL PHYSICS.

Physical properties of soils including water retention and movement, soil air and temperature, soil texture and structure; their measurements, evaluation and influence in soil systems. Prerequisite, Plant and Soil Science 105, Physics 103-104 or their equivalents. 2 class hours, 1 3-hour laboratory period. *Credit, 3. Mr. Stewart.*

275 (I). SOIL CHEMISTRY.

The inorganic and organic chemical reactions related to the nutrient supply in soils and soil nutrition of plants. Colloidal aspects of soil chemical reactions and soil-plant mineral relationships. Prerequisites, Chemistry 127 and Plant and Soil Science 265 or equivalents. 2 class hours, 1 3-hour laboratory period. *Credit, 3. Mr. Baker.*

280 (II). SOIL-PLANT MINERAL NUTRITION.

Mineral nutrition in the growth of plants; the use and interactions of fertilizers and other soil amendments; soil reaction; mineral deficiencies and toxicities in plants. 2 class hours, 1 2-hour laboratory period. *Credit, 3. Mr. Drake.*

285 (I). MICROBIOLOGY OF THE SOIL.

Soil microorganisms; their distribution, ecology and transformation of organic and inorganic substrates. Microbiology of the rhizosphere and the biological equilibrium. Prerequisite, Microbiology 250 or permission of instructor. 2 class hours, 1 3-hour laboratory period. *Credit, 3. Mr. Gunner.*

385 (I), 386 (II). SPECIAL PROBLEMS.

Credit, 3 per semester. Staff.

390 (I), 391 (II). SEMINAR.

Credit, 1-2 per semester. Staff.

Veterinary and Animal Sciences

Head of Department: Professor T. W. Fox. Professors D. Black, W. Black, Damon, Mellen, Smith, Smyth; Associate Professors Anderson, Grover, Howe; Assistant Professors Borton, Lyford; Instructor Denison.

The Department of Veterinary and Animal Sciences offers a program of study in the animal sciences. All students are expected to take Animal Science 121, 220, 330, 334, 321, 308, 353, 354; Food Science and Technology 258; Zoology 135 and 240; and Microbiology 140. The curriculum provides for an important degree of flexibility depending upon the students' interests and abilities.

Pre-veterinary students in the College of Agriculture major in animal science as freshmen. Students completing two semesters of academic work with a satisfactory cumulative average (2.5) may apply to the pre-medical advisory committee in their third semester for entrance into the pre-veterinary curriculum. Such students are counselled in the Department of Veterinary and Animal Sciences.

121 (I). INTRODUCTORY ANIMAL SCIENCE.

Modern animal and poultry science and its role in national and world economies. 2 class hours, 1 2-hour laboratory. *Credit, 3. Mr. Borton.*

220 (II). ANIMAL PHYSIOLOGY.

A comparative study of the physiology of mammals and birds with emphasis on those aspects most pertinent to animal science. Prerequisite, Zoology 135. 3 class hours, 1 3-hour laboratory. *Credit, 4. Mr. Howe.*

256 (II). LIVESTOCK PRODUCTION.

Beef, sheep and swine production in New England and the United States. Field trips cost approximately \$5.00. 3 class hours, 1 2-hour laboratory period. *Credit, 4. Mr. Borton.*

308 (II). COMPARATIVE ANIMAL GENETICS.

The mechanisms of heredity and variation in livestock and poultry; the role of selection and breeding systems in genetic improvement and their evaluation. Prerequisite, Zoology 240. 3 class hours. *Credit, 3. Mr. Fox.*

321 (I). PHYSIOLOGY OF REPRODUCTION.

Comparative aspects of anatomy, embryology, endocrinology and physiology of reproduction and lactation. 3 class hours, 1 2-hour laboratory period. *Credit, 4. Mr. D. Black and Mr. W. Black.*

330 (I). PRINCIPLES OF ANIMAL NUTRITION.

Scientific principles of nutrition in both ruminants and non-ruminants. 3 class hours. *Credit, 3. Mr. Anderson.*

334 (II). APPLIED ANIMAL NUTRITION.

Application of scientific principles of nutrition to practical feed formulation and feeding systems for poultry and livestock. Prerequisite, Animal Science 330. 1 class hour, 2 2-hour laboratory periods. *Credit, 3. Mr. Anderson.*

353 (I). POULTRY MANAGEMENT.

Principles of poultry business management. Designed to give the student a comprehensive view of all phases of the poultry industry. Field trips cost \$10.00–\$15.00. 2 class hours, 1 2-hour laboratory. *Credit, 3. Mr. Grover.*

354 (II). DAIRY HERD MANAGEMENT.

Dairy cattle and milk production in New England and the United States, including a study of managerial problems concerned with successful dairying. Field trips cost \$10.00–\$15.00. 2 class hours, 2 2-hour laboratory periods. *Credit, 4. Staff.*

359 (I). LIGHT HORSE MANAGEMENT.

Breeds and adaptations; feeding, training and management; tack and its care, brief introduction to equitation. Field trips cost \$5.00–\$10.00. Open to all University students. 1 class hour, 1 2-hour laboratory period. *Credit, 2. Mr. Borton.*

370 (II). ANIMAL PATHOLOGY.

An introduction to the study of animal diseases. The causes, development, transmission and control, with application to diseases of animals which are of economic and/or public health importance. Prerequisites, Microbiology 140 or Zoology 135. 3 class hours. *Credit, 3. Mr. Smith.*

385 (I), 386 (II). SPECIAL PROBLEMS.

Independent study for qualified seniors in specific subject areas, involving either extensive literature review or an experimental approach to a research problem. *Credit, 1–3 each semester.*

390 (I), 391 (II). SEMINAR.

Review of current literature in Animal Science.

Credit, 1 each semester.

RELATED COURSE:

Food Science and Technology 258 (II). Animal Products and By-Products.

Pre-Dental, Pre-Medical, Pre-Veterinary Program

Chief Adviser: Assistant Professor Benjamin C. Crooker, Department of Physics.

A pre-professional student should select a major department in the field of most interest to him. Requirements for professional schools can be completed within the four-year curriculum of most departments in the University. Minimum preparation for pre-dental and pre-medical students is one year of inorganic, one year of organic, and one semester of analytical chemistry; three semesters of biology; one year of college mathematics and one year of physics. Minimum requirements for pre-veterinary students are similar but they should include in their curriculum the specific courses Zoology 221, Zoology 240, and Animal Science 121. Certain additional courses in biology, chemistry, or mathematics, as well as a foreign language may be required by some dental, medical, and veterinary schools. Students should consult their advisers as well as professional school catalogs in regard to specific requirements of particular schools.

College of Arts and Sciences

SEYMOUR SHAPIRO, *Acting Dean*

John M. Maki, *Vice-Dean*

Robert B. Livingston, *Associate Dean*

Robert W. Wagner, *Associate Dean*

Geard W. McFarland, *Assistant Dean*

H. Duncan Rollason, *Assistant Dean*

Stephen I. Allen, *Assistant Dean*

Norman C. Ford, Jr., *Assistant Dean*

Donald C. Freeman, *Assistant Dean*

The College has programs of study leading to four bachelor degrees: Bachelor of Arts, Bachelor of Science, Bachelor of Fine Arts, and Bachelor of Music. All of these programs involve a blend of study in depth in one area with additional study in each of the main divisions: a) humanities and fine arts, b) social and behavioral sciences, and c) natural science and mathematical disciplines. Courses appropriate for the distributional requirements in these three areas are noted in the University Bulletin with the respective codes (C), (D), and (E).

A program of study which conforms with the following provisions qualifies the student who completes it for the appropriate degree:

1. One hundred and twenty (120) credits in addition to work applicable to the University Physical Education requirement; of these no more than four (4) credits may be in applied music except for a student whose major is music.
2. A basic proficiency or experience with written or spoken English representing at least six (6) credits

in either the courses English 111–112 along with one of the Speech courses 101, 105, 107, or 150, or a rhetoric program subsequently approved.

3. For the B.A. and B.S. degrees, a basic proficiency or experience with foreign language as demonstrated by a) completion of a foreign language course at the college fourth-semester level, b) a satisfactory performance on an achievement or placement test, c) four entrance units in one foreign language or three units in one and two units in another foreign language, d) a year in a school in which English is not the basic language, or 3) an approved substitution of language related study if there is clearly demonstrated difficulty in language study.
 4. One of the pairs of literature courses approved for core requirement “C” and, in addition:
 - a. Two courses from the “C” group for the B.A. degree.
 - b. One course from the “C” group for the other degrees.
 5. Three courses from the “D” group chosen from at least two departments; one additional course from the behavioral and social sciences for the B.A. degree.
 6. Four courses from the “E” group and from at least two of these three groups of disciplines:
 - a. logic, mathematics, and statistics
 - b. botany, entomology, microbiology, and zoology
 - c. astronomy, chemistry, geology, and physics
- To qualify for a B.S. degree, the student must have a major in mathematics, science, or behavioral science, and earn at least 48 credits in these areas in addition to the four courses from the “E” group.
7. An approved major program of the College.
 8. Advanced placement and transfer credits may be applied toward any or all of the above; at least half of the major program must be taken in residence.

pology, with at least twenty-one of these credits chosen from courses above the 100 level. The maximum acceptable credits in Anthropology is 36. Under special circumstances and with his adviser's approval, an Anthropology major may be allowed to substitute as part of this requirement up to nine credits of related Sociology courses, or non-duplicating courses in Anthropology given at another of the Five-College Cooperative institutions. It is strongly recommended that majors elect Zoology and Geology for partial fulfillment of their science requirements.

102 (I) or (II). INTRODUCTION TO ARCHAEOLOGY (D)

The history, methods and theory of archaeology, with an outline of the main characteristics of the prehistoric record throughout the world. 3 class hours. *Credit, 3.*

103 (I). INTRODUCTION TO PHYSICAL ANTHROPOLOGY.

Human evolution, human variation, racial classifications, racism, and modern theories of variation. 3 class hours. *Credit, 3.*

104 (I) (II). INTRODUCTION TO CULTURAL ANTHROPOLOGY (D).

Social and cultural Anthropology dealing with variations among societies in technology and economics, social and political organization, art, religion, and ideology. 3 class hours. *Credit, 3.*

105 (I). INTRODUCTION TO LINGUISTIC ANTHROPOLOGY.

Survey of the role and contributions of linguistics in anthropology. Biological foundations of language; the process of communication; language structure; linguistic ontogeny, phylogeny, and prehistory; the principle of linguistic relativity; and other topics. 3 class hours. *Credit, 3.*

220 (II). RESEARCH TECHNIQUES IN PHYSICAL ANTHROPOLOGY; SKELETAL ANALYSIS.

Methods for excavating and analyzing human skeletal material with emphasis on sexing and aging techniques. Problems in growth and development and in pathology. 2 2-hour labs. *Credit, 3.*

234 (I). PRIMITIVE ART.

A survey of the cultural and aesthetic aspects of the visual arts of primitive societies in sub-Saharan Africa, Oceania, and North America. Emphasis on the function and meaning of art in society. *Credit, 3.*

237 (I). PEOPLES OF MESOAMERICA.

A survey of the peoples and cultures of Mesoamerica from the earliest human habitation to contemporary national cultures. Major trends will be traced from pre-Cortesian times through the colonial period to independence. Prerequisite, Anthropology 104. 3 class hours. *Credit, 3.*

252 (II). RURAL AND PEASANT SOCIETIES.

Rural and peasant societies from the standpoint of their population and institutions, their emerging needs, and their relation to mass society. Prerequisite, Sociology 101 or Anthropology 104. 3 class hours. *Credit, 3.*

Anthropology

Head of Department: Professor Richard B. Woodbury.
Professor Halpern; Associate Professors Fraser, Pi-Sunyer, Salzmänn; Assistant Professors Armelagos, Fortier, Harrison, Munn, Proulx.

Anthropology majors must take Anthropology 104 and one other of the following introductory courses: 102, 103, or 105. They should also select three courses (two of which must be introductory) from the following social sciences: Sociology, Economics, Government and Psychology. All majors must elect a minimum of thirty credits in Anthro-

260 (II). PEOPLES OF EUROPE: EASTERN EUROPE AND THE U.S.S.R.

A survey of the peoples and cultures of Eastern Europe; emphasis on the Slavic peoples as well as upon those cultures transitional between Europe, the Middle East and Asia from their prehistoric origins to the period of their modernization, stressing the role of peasants and nomads with their changing ecological adaptations. Prerequisite, Anthropology 104. 3 class hours. *Credit, 3.*

261 (II). PEOPLES OF EUROPE: THE WESTERN MEDITERRANEAN.

A survey of the peoples and cultures of Mediterranean Western Europe. Emphasis on the historical span from the crystallization of distinct national cultures to the present. 3 class hours. *Credit, 3.*

269 (I). CULTURES OF AUSTRALIA AND NEW GUINEA.

The ethnography of aboriginal Australia and New Guinea with emphasis on the particular problems of theory and analysis that have concerned anthropologists studying these areas. Prerequisite, Anthropology 104. 3 class hours. *Credit, 3.*

335 (II). NATIVE AMERICAN LANGUAGES.

A survey of American Indian languages, primarily north of Mexico. Genetic classifications and Sapir's classification based on structural resemblances between language families. Types of linguistic structure and structural restatements. Comparative work and reconstructions. Prerequisite, Anthropology 105 or permission of instructor. 3 class hours. *Credit, 3.*

340 (I). RELIGION AND RITUAL.

Classical problems in the anthropology of religion from Durkheim and Tylor to Evans-Pritchard, Levi-Strauss and Lloyd Warner. Special attention to the analysis of ritual. Prerequisite, Anthropology 104 or permission of instructor. 3 class hours. *Credit, 3.*

364 (II). PROBLEMS IN ANTHROPOLOGY (D).

Examination of selected problems in physical anthropology, archaeology, social and cultural anthropology. Illustrative material drawn from both non-literate and peasant societies. Prerequisite, Anthropology 104 or permission of instructor. 3 class hours. *Credit, 3.*

365 (I). WORLD ETHNOGRAPHY (D).

Selected societies of Africa, the Americas, Asia and Oceania. Problems of comparing societies, especially with regard to their environmental contexts and levels of productivity. Prerequisite, Anthropology 104 or permission of instructor, 3 class hours. *Credit, 3.*

366 (II). THE INDIVIDUAL AND SOCIETY (D).

Selected approaches to the interrelations of individual behavior and social patterns, with consideration of data on "Western" and "non-Western" societies. Prerequisite, Anthropology 104 or permission of instructor. 3 class hours. *Credit, 3.*

367 (II). CULTURES OF AFRICA (D).

An extensive survey of the cultures of Africa, a comparison of their social, political, religious, and economic patterns, and toward consideration of the evolution and interrelationship of the cultures of the area. Prerequisite, Anthropology 104 or permission of instructor. 3 class hours. *Credit, 3.*

368 (I). OLD WORLD PREHISTORY (D).

A survey of the prehistoric cultures of Europe, Asia, and Africa, with emphasis on the Paleolithic, Neolithic and early metal-using periods. This course is designed to give the student an understanding of the significant cultural developments in the Old World before the emergence of historic civilizations. 3 class hours. *Credit, 3.*

369 (I). NORTH AMERICAN ARCHAEOLOGY (D).

An intensive survey of American Indian prehistory north of Mexico will emphasize the historical development processes in selected geographical regions. Prerequisite, Anthropology 102. 3 class hours. *Credit, 3.*

370 (II). NORTH AMERICAN INDIANS (D).

Indian tribes with various levels of technological development and social complexity, from areas north of Mexico, in terms on their environmental context and the impact of non-Indian societies on their cultures. Prerequisite, Anthropology 104. 3 class hours. *Credit, 3.*

371 (III). HUMAN EVOLUTION.

The mechanisms of evolutionary change, the fossil and archaeological evidence bearing on man's evolution, and an evaluation of the various interpretations of the evidence. Prerequisite, Anthropology 103. 3 class hours. *Credit, 3.*

373 (I). CULTURES OF SOUTHEAST ASIA (D).

An introduction to the history and ethnography of the native cultures of Southeast Asia, including consideration of the peasant populations and their expanding role in the development of modern Southeast Asian states. Prerequisite, Anthropology 104 or permission of instructor. 3 class hours. *Credit, 3.*

374 (II). CULTURES OF THE FAR EAST (D).

A survey of culture-history and ethnography of representative people of East Asia; peasant sub-cultures of traditional contemporary China, Japan, and Korea. Prerequisite, Anthropology 104 or permission of instructor. 3 class hours. *Credit, 3.*

375 (I). SOUTH AMERICAN ARCHAEOLOGY (D).

A survey of the pre-Columbian cultures of South America and their development, with special emphasis on the Andean Areas. 3 class hours. *Credit, 3.*

376 (II). SOUTH AMERICAN ETHNOLOGY (D).

An analysis of the Colonial and contemporary cultures of South America with emphasis on Indian tribes. The interrelationship of Indian, European and Negro societies and their contributions will be stressed. Prerequisite, Anthropology 104 or permission of instructor. 3 class hours. *Credit, 3.*

377. SUMMER FIELD SCHOOL IN ARCHAEOLOGY.

Practical experience and training in archaeology. Both prehistoric and colonial sites will be excavated, and instruction will be given in archaeological methods and techniques. Prerequisite, Anthropology 102 or equivalent and permission of instructor. *Credit, 6.*

378 (II). THEORY AND METHOD IN ARCHAEOLOGY (D).
An intensive examination into the scientific approach to modern archaeological research and the utilization of this approach for deriving and testing theories of prehistory and human behavioral patterns. Prerequisite, Anthropology 360 and permission of instructor. 3 class hours. *Credit, 3.*

379 (II). CULTURAL DYNAMICS AND APPLIED ANTHROPOLOGY (D).

Theories of cultural process and their application to practical cross-cultural situations in administration, technical assistance and community development. Prerequisite, Anthropology 104 or permission of instructor. 3 class hours. *Credit, 3.*

380. FIELD COURSE IN CULTURAL ANTHROPOLOGY.

A summer course affording the advanced undergraduate or graduate student supervised training in cultural anthropological research. Location varies from year to year. Prerequisites, advanced course work in Anthropology and permission of instructor. *Credit, 6.*

385. SPECIAL PROBLEMS IN ANTHROPOLOGY. *Credit, 1-3.*

386. SPECIAL PROBLEMS IN ANTHROPOLOGY. *Credit, 1-3.*

388. READINGS IN ANTHROPOLOGY. *Credit, 1-3.*

389. READINGS IN ANTHROPOLOGY. *Credit, 1-3.*

Art

Head of Department: Professor Paul F. Norton, Professors Becker, Benson, Kamys, Perkins; Associate Professors Coughlin, Mallary, Matheson, Roskill, Roy, Wardlaw, Wozniak; Artist-in-Residence Grillo; Assistant Professors Berube, Cheney, Gongora, Hendricks, Parker, Schleappi, Townsend, Wang, Wiedenhoef; Instructors Minisci, Poritz, Tarr, Walker; Lecturer Parks.

The Department of Art offers three programs serving a range of objectives. The first of these leads to a Bachelor of Arts degree with a major in Art and is designed to provide a good general historical and aesthetic knowledge of the arts while affording an opportunity to develop creative ability in the several media. By arrangement with the School of Education, courses can be so arranged that an art major will secure the necessary credits in education to allow him to teach art in the public schools. All studio majors are expected to take 115 Introduction to Art, 100, 102 Basic Drawing and 120, 122 Basic Design during their first two years. Majors wishing to specialize in art history are advised to take 115 and at least 24 hours of courses numbered 200 or above; these may be entirely art history courses.

The other two programs are of a professional nature and lead to a Bachelor of Fine Arts degree. A student must

petition the department for admission to either of these programs. Admission is based on the criteria of demonstrated ability and high academic standing so that these programs have the flavor of honors work. The program, which builds the best foundation for graduate study in art, involves a minimum of 63 credits in Studio Art, at least 12 credits in Art History and at least 48 credits in other disciplines. The alternative program, for prospective art teachers, involves minima of 33 credits in Studio Art, 9 in Art History (48 combined), 6 in Art Education, 15 for teacher certification, and 51 credits in other disciplines.

CREATIVE ART

100. BASIC DRAWING (C).

Drawing in black and white, applying pencil, crayon, charcoal techniques to representation in line and tone, emphasizing sound observation and effective presentation. 6 studio hours. *Credit, 3.*

102. DRAWING COMPOSITION.

Continuation of Art 100. Emphasis on pictorial composition and advanced drawing techniques. 6 studio hours. *Credit, 3.*

120. BASIC DESIGN I (C).

Two-dimensional design concepts arising out of work with specific problems in a variety of media. 6 studio hours. *Credit, 3.*

122. BASIC DESIGN II.

Continuation of Art 120. Specific three-dimensional problems stressing the inter-relationship of materials, processes, techniques, and sculptural concepts. Prerequisite, Art 120. 6 studio hours. *Credit, 3.*

220. PAINTING I.

Easel painting in oil and related media, based on elementary understanding of physical properties of medium, and encouraging individual directions within limitations of sound composition. Prerequisites, Art 100, 120. 6 studio hours. *Credit, 3.*

222. PAINTING II.

Initial concentration on transparent water color, emphasizing control of techniques and mastery of color relationships. Further experience with opaque water color, such as gouache, casein. Prerequisites, Art 100, 120. 6 studio hours. *Credit, 3.*

224. PAINTING III.

Continuation of Art 220. Prerequisite, Art 220. 6 studio hours. *Credit, 3.*

226. PAINTING IV (Techniques and Materials).

Advanced work in traditional and contemporary painting techniques and media. Includes encaustic, tempera, oil, oil-resin, acrylic polymer, synthetic media, grounds and supports. 6 studio hours. Prerequisite, Art 222, 224. *Credit, 3.*

230. ADVANCED DRAWING.

Investigation and development of various techniques and media with special emphasis on figure drawing. Prerequisites, Art 100, 102. 6 studio hours. *Credit, 3.*

232. ADVANCED DRAWING PROBLEMS.

Advanced work in traditional and contemporary drawing media. Independent exploration of graphic problems emphasized. Solutions to problems sought in relation to student's personal objectives. Prerequisite, Art 230. 6 studio hours. *Credit, 3.*

240. PRINTMAKING: RELIEF I.

Basic study of material, technique, and aesthetic considerations peculiar to relief. Students print their own work. Prerequisites, Art 100, 120 or permission of instructor. 6 studio hours. *Credit, 3.*

242. PRINTMAKING: INTAGLIO I.

Basic study of materials, techniques, and aesthetic considerations peculiar to etching, engraving, and aquatint. Students print their own work. Prerequisite, Art 100, 120, or permission of instructor. 6 studio hours. *Credit, 3.*

244. PRINTMAKING: LITHOGRAPHY I.

Basic study of materials, techniques, and aesthetic considerations peculiar to lithography. Students print their own work. Prerequisites, Art 100, 120, or permission of instructor. 6 studio hours. *Credit, 3.*

246. PRINTMAKING: RELIEF II.

Advanced study of materials, techniques, and aesthetic considerations relevant to relief printmaking. Students print their own work. 6 studio hours. Prerequisite, Art 240, 242, 244. *Credit, 3.*

248. ART EDUCATION: METHODS AND MATERIALS I.

The development of secondary curricula through personal involvement with classroom procedures and materials. 6 studio hours. Prerequisite for qualified upper class art majors who wish to be elementary art teachers or art supervisors. *Credit, 3.*

250. ART EDUCATION: METHODS AND MATERIALS II.

The development of secondary curricula through personal involvement with classroom procedures and materials. Prerequisite for qualified upper class art majors who wish to be secondary art teachers. 6 studio hours. *Credit, 3.*

260. SCULPTURE I.

Experimentation with materials. Investigation into the nature of 3-dimensional form. The development of 3-dimensional order. Individual projects. Prerequisites, Art 100, 122. 6 studio hours. *Credit, 3.*

262. SCULPTURE II.

Continuation of Art 260. Prerequisite, Art 260. 6 studio hours. *Credit, 3.*

264. SCULPTURE III.

A sequence of problems in direct and cast metal sculpture, using a variety of metals, techniques, and processes. The course emphasizes traditional and modern foundry methods, and includes gas and electric welding. 6 studio hours. Prerequisite, Art 262 (previously or concurrently). *Credit, 3.*

266. SCULPTURE IV.

Designed to encourage the student to develop a personal approach to sculpture and to make creative decisions of his own. The student selects projects and materials of interest to himself

and completes them within a classroom situation. 6 studio hours. Prerequisite, Art 264 (previously or concurrently).

Credit, 3.

280. CERAMICS I.

Involvement with form through the use of clay and related materials. Hand-building and work on the potter's wheel stress a creative, aesthetic approach. 6 studio hours. Prerequisite, Art 100 or 120. *Credit, 3.*

282. CERAMICS II.

Continuation of Art 280. Prerequisite, Art 280. 6 studio hours. *Credit, 3.*

284. CERAMICS III.

Creation of sculptural ceramic forms with stress on increased scale and aesthetic principles, rather than the production of utilitarian ceramic forms. 6 studio hours. Prerequisite, Art 282. *Credit, 3.*

286. CERAMICS IV.

Research and investigation in clay body fabrication, glaze formulation and Ceramic coloring media. 6 studio hours. Prerequisite, Art 282. *Credit, 3.*

320. PAINTING V.

Emphasis on the exploration of traditional and contemporary attitudes and approaches toward painting the human figure. 6 studio hours. Prerequisite, Art 224 and 226. *Credit, 3.*

322. PAINTING VI.

Advanced work in painting composition with an emphasis on independent exploration of painting problems and the development of effective personal forms of visual communication. 6 studio hours. Prerequisite, Art 224. *Credit, 3.*

340. PRINTMAKING: INTAGLIO II.

Advanced study of materials, techniques, and aesthetic considerations relevant to etching, engraving, and aquatint. Students print their own work. 6 studio hours. Prerequisite, Art 240, 242, 244. *Credit, 3.*

342. PRINTMAKING: LITHOGRAPHY II.

Advanced study of lithography, with particular emphasis on the concepts and techniques of color lithography. 6 studio hours. Prerequisite, Art 240, 242, 244. *Credit, 3.*

360. SCULPTURE V.

Advanced work in constructions and assemblage, featuring both formal and informal methods of composition, in a variety of materials and assembly techniques. 6 studio hours. Prerequisite, Art 266. *Credit, 3.*

362. SCULPTURE VI.

Individual, collaborative and class projects of an advanced nature in new sculptural media such as plastics, light, and kinetics. Also inter-media projects involving the combination of sculpture with other arts such as painting, photography, architecture, urban design, music, dance, theater etc. 6 studio hours. Prerequisite, Art 360 (previously or concurrently). *Credit, 3.*

380. CERAMICS V.

Advanced exploration of non-ceramic media such as: plaster, plastics, metals, wood, stone, etc., and their application to creative expression in clay. Emphasis on individual objectives. 6 studio hours. Prerequisite, Art 284, 286. *Credit, 3.*

382. CERAMICS VI.

A synthesis of practical problems encountered in operation, management and maintenance of a Ceramic facility. Examination of production techniques, equipment design and material procurement. 6 studio hours. Prerequisite, Art 286. *Credit, 3.*

385, 386. SPECIAL PROBLEMS.

For qualified senior art majors who wish to specialize further in a particular aspect of art. Arrangements must be made with members of the department. *Credit, 1-3.*

388. B.F.A. DEGREE PROJECT—CERAMICS, PAINTING, PRINTMAKING AND SCULPTURE.

An independent advanced investigation and work pursued under the direction of a selected member of the faculty and designed to evolve a body of work mature in concept and individual in style. Specific requirements to be established by the director of the work. Independent studio work directed through frequent consultation with instructor. Prerequisite, Ceramics-Art 380, 382. Painting-Art 320, 322. Printmaking-Art 246, 340, 342. Sculpture-Art 360, 362.

HISTORY OF ART

115. INTRODUCTION TO ART (C).

An introduction to great works of art studied in historical sequence, including techniques and aesthetic principles. 3 class hours. *Credit, 3.*

205. ANCIENT ART AND ARCHAEOLOGY (C).

The art of early cultures, mainly in the European region, including Greek and Roman sculpture and painting. Students are encouraged to take Art 115 before this course. 3 class hours. *Credit, 3.*

225. MEDIAEVAL ART (C).

Earliest phases of Christian art in catacombs, barbaric influences of northern Europe, Byzantine developments in the East, and the Romanesque and Gothic in the West. Students are encouraged to take Art 115 before this course. 3 class hours. *Credit, 3.*

245. RENAISSANCE ART (C).

Painting, sculpture, architecture, with particular attention given to Italian Art. Emphasizes social and historical importance of arts, and changes in style and aesthetic theory. 3 class hours. *Credit, 3.*

265. BAROQUE ART (C).

The art of the 17th and early 18th centuries in Italy, Spain, Germany, France and the Low Countries. It is advisable for students to take Art 115 before this course. 3 class hours. *Credit, 3.*

271. ART OF INDIA.

The effect of the great Eastern religious movements on art in India and surrounding territories. Some attention given to secular art and architecture in modern times. 3 class hours. *Credit, 3.*

273. THE HINDU TEMPLE.

The conception and development of the Hindu Temple in South and Southeast Asia, with an emphasis on the structural traditions of the regions covered. 3 class hours. *Credit, 3.*

275. CHINESE PAINTING.

Shang tomb paintings, Han, Sung, Yuan, Ming and Ch'ing dynasty art, and the interplay between the art of Japan and the West. 3 class hours. *Credit, 3.*

277. ART OF BUDDHISM.

The development of Buddhist Arts as they spread through Central Asia into East Asia, and as they spread through Southeast Asia. Special consideration will be given to the influence of the changing religion on the arts. 3 class hours. *Credit, 3.*

285. EUROPEAN ART, 1780-1880.

Major developments in painting from David to Post-Impressionism in France, England, and Germany. 3 class hours. *Credit, 3.*

287. MODERN ART, 1880 TO THE PRESENT.

Emphasis on major artists such as late Cezanne and Gauguin, Picasso, Matisse, Klee, Jackson Pollock, Optical and Pop artists. Main developments of style will be considered in relation to these artists. 3 class hours. *Credit, 3.*

291. MODERN ARCHITECTURE (C).

History of the changes in style, technical advances, and aesthetic principles during the past two hundred years. 3 class hours. *Credit, 3.*

295. AMERICAN ART (C).

The earliest Colonial art and architecture, the impact of later European influences; regional art of the late 19th and 20th centuries, and contemporary developments. 3 class hours. *Credit, 3.*

375, 377. MASTERS OF WESTERN ART.

Intensive study of the work of a master in the field of art. Permission of instructor. 1 or 2 class hours. *Credit, 3.*

385, 386. SPECIAL PROBLEMS.

For qualified senior art majors who wish to specialize further in a particular aspect of art. Arrangements must be made with members of the department. *Credit, 1-3.*

391. ROMAN ART (C).

Origins and development of Roman architecture, portraiture, historical relief, painting and mosaics. Prerequisites, Art 115 or 205, or Ancient History or consent of instructor. 3 class hours. *Credit, 3.*

393. CRITICISM OF MODERN ART.

Practical exercises in the evaluation of modern paintings. Discussion of the results. 2 class hours. *Credit, 2.*

Asian Studies

Chairman of Program: Associate Professor William Naff.
Instructors: Miller, Shibano.

Although there is no major program in Asian Studies, the chairman can help students arrange a comprehensive and

correlated series of courses dealing with the Far East. This provides an interdisciplinary approach, and at the same time, permits flexibility in student programs.

CHINESE 110 (I), 120 (II). ELEMENTARY CHINESE.

For those who have had no previous training in Chinese. Intensive practice in the language skills. 3 class hours, 2 laboratory hours. *Credit, 3. Mr. Miller*

JAPANESE 110 (I), 120 (II). ELEMENTARY JAPANESE.

For those who have had no previous training in Japanese. Intensive practice in the language skills. 3 class hours, 2 laboratory hours. *Credit, 3. Miss Shibano.*

JAPANESE 130 (I), 140 (II). INTERMEDIATE JAPANESE.

Continued development of skills in written and spoken Japanese. 3 class hours, 2 laboratory hours. *Credit, 3. Miss Shibano.*

150 (I), (II). THE DEVELOPMENT OF MODERN ASIA. (D).

Problems of the nations of East and Southeast Asia created by the transition from traditional, pre-modern status to modern nationhood and full involvement in world affairs. 3 class hours. *Credit, 3.*

269 (I). INDIA AND SOUTH ASIA (D).

Introductory study of recent political, economic, and social developments in India and countries of South and Southeast Asia. By permission may be counted for major credit in government and sociology. Prerequisites, at least two semester courses in one or more of the following fields: economics, government, sociology. 3 class hours. *Credit, 3. Mr. Driver.*

RELATED COURSES

ANTHROPOLOGY 373, 374. Cultures of Southeast and Far East Asia.

COMPARATIVE LITERATURE 241 (I). The Chinese Literary Tradition: Contemporary China I (C).

COMPARATIVE LITERATURE 251 (I). Chinese Literary Genres: Poetry and Mysticism I (C).

COMPARATIVE LITERATURE 252 (II). Chinese Literary Genres: Vernacular Literature II (C).

COMPARATIVE LITERATURE 242 (II). The Chinese Literary Tradition: Classical China II (C).

COMPARATIVE LITERATURE 243 (I). Japanese Literary Tradition: I (C).

COMPARATIVE LITERATURE 244 (II). Japanese Literary Tradition II (C).

GOVERNMENT 237. Government and Politics of China and Japan.

GOVERNMENT 238. Government and Politics of South and Southeast Asia.

HISTORY 350, 351. History of Far Eastern Civilization.

SOCIOLOGY 265. The Population of Japan.

Biochemistry

Acting Head of Department: Professor Henry Little. Associate Professors Gawienowski, Robinson, Westhead; Assistant Professor Nordin, Parsons.

Course Outline

The sample curriculum outlined below conforms to college requirements and closely follows recommendations made at the Symposium on Pregraduate Education in Biochemistry held by the American Society of Biological Chemists in 1965.

First Year: Chemistry 113–114, Mathematics 123–124, Elementary Biology I–II*, German 110–120, English 111–112, Speech 101 (I).

Second Year: Chemistry 165–166 or 261–262, Chemistry 167 or 263–264, Mathematics 173–174, Physics 141–142, German 130, 140 and English 125–126.

Third Year: Biochemistry 223–224; Biochemistry 225–226, Chemistry 210 (I)—Elementary Biological Science (II), Chemistry 281–282 or 285–286, Social Sciences (I, II), Humanities (I, II), Computer Science (II).

Fourth Year: Chemistry 213 or 272 and an elective. Advanced Biological Science (I, II) e.g., 388 Introduction to Research (I, II), Social Science (I, or II).

120 (II). INTRODUCTION TO BIOCHEMISTRY (E).

A brief introduction to biochemistry as a terminal course for students whose professional objectives do not necessitate more extensive training in Chemistry. Prerequisite, Chemistry 112. 3 class hours, 1 3-hour laboratory period. *Credit, 4. Staff.*

220 (I). ELEMENTARY BIOCHEMISTRY.

The more important facts relating to the chemistry of biological materials and processes. Designed primarily for students not eligible for Chemistry 223. Not open to chemistry majors. Prerequisite, Chemistry 160 or 261. 3 class hours, 1 3-hour laboratory period. *Credit, 4. Mr. Nordin.*

222 (II). GENERAL BIOCHEMISTRY.

A special section of Biochemistry 223 for students who may complete only one semester of biochemistry. Prerequisite, Chemistry 261, and Chemistry 262 (concurrently).

Credit, 3. Mr. Robinson.

223 (I), 224 (II). GENERAL BIOCHEMISTRY.

A broad introduction to the general field of biochemistry for students majoring in chemistry or in the biological sciences, and a background for more advanced or specialized study in this field. Prerequisites, Chemistry 166 or equivalent and Chemistry 281 for the second semester. 3 class hours, required of all biochemistry majors. *Credit, 3. Mr. Little.*

*Selected from Botany, Microbiology, Zoology in any order.

225 (I), 226 (II). GENERAL BIOCHEMISTRY LABORATORY. For Biochemistry majors and beginning graduate students in Biological Sciences. Lab material on laboratory techniques useful in solving problems in biochemical research.

Credit, 1 or 2. Mr. Parsons.

388 (I, II). INTRODUCTION TO RESEARCH.

Admission only by permission of the department. Each student is assigned some special subject or problem in biochemistry. By arrangement. 10 laboratory hours.

Credit, 5. Staff.

Botany

Head of Department: Associate Professor Otto L. Stein. Professors Bierhorst, Gentile, Livingston, Lockhart, Schuster, Shapiro, Smith, Tipppo; Associate Professors H. Bigelow, Davis, Rowley, Wilce; Assistant Professors M. Bigelow, Fultz, Klekowski, Mulcahy, Stern, Stroup, Walker; Instructor Roberts; Herbarium Curator: Ahles; Staff Associate: Meyer.

Programs in Botany prepare students for teaching and research in biological sciences in high schools, universities, industry and experimental stations. Majors who expect to prepare for graduate training in Botany (other than that in preparation for secondary school teaching) must take:

Chemistry 111–112

Chemistry 261–262, 263–264; or Chemistry 160 and Biochemistry 220 (Botany 212 may be substituted for Biochemistry 220)

Mathematics: One year of calculus, usually fulfilled by completing Mathematics 113 or Mathematics 124 or Mathematics 136

Physics 141–142

Zoology 240

Foreign Language: German, Russian, or French, in that order, are preferred

Botany 100 or 101, 211 (physiology), 303–304 (morphology) and an additional 12 credits of junior-senior courses in Botany from at least 2 of the following courses:

ecology (221, 222, 226)

anatomy and morphogenesis (291, 301)

cytology and cytogenetics (270, 311)

physiology (212, 215, 261)

systematics (281)

Students are strongly encouraged to take a course in Microbiology (preferably Microbiology 250) and may substitute such a course for one advanced course in Botany. Students who have had no high school Zoology or who believe their background to be inadequate, should take Zoology 101. Knowledge of a foreign language is strongly

recommended and German, Russian, or French, in that order, are preferred.

Students planning to teach in secondary school must take:

Chemistry: 111–112, 160, Biochemistry 220 (Botany 212 may be substituted for Biochemistry 220)

Mathematics 111–113 or 123–124, or 135–136

Physics 141–142

Zoology 135, 240

Botany 100 or 101, 125, 126, 211 and 11 additional credits in junior-senior courses in Botany from at least 2 of the areas (ecology, physiology, etc.) listed above.

Students planning to teach are strongly encouraged to take a course in Microbiology (preferably Microbiology 250) and may substitute such a course for one advanced course in Botany.

Additional requirements for certification are Psychology 301 and Education 251 in the junior year, and Education 285, 310 and 311 which are required in one semester of the senior year.

100 (I), (II). INTRODUCTORY BOTANY (E).

Structure, function and reproduction of plants, dealing primarily with the flowering plants. Basic biological principles are emphasized. Not to be taken serially with Botany 101. 2 class hours; 1 quiz hour; 1 2-hour laboratory period.

Credit, 3. Staff.

101 (I), (II). GENERAL BOTANY (E).

An introduction to basic biological principles of organization, development and evolution, using botanical illustrations. The foundations and approach in biological research, and the consequence of this research on human thought and experience will be stressed. Not open to science majors without permission of major department. Not to be taken serially with Botany 100. 2 class hours; 1 demonstration-discussion hour.

Credit, 3. Staff.

121. PLANTS AND ENVIRONMENT (E).

A consideration of the interrelationships between plants and their environment, emphasizing the impact of man's influence and control on the economy of natural biological areas. Designed for non-science majors. 2 class hours, 1 3-hour laboratory period. Not open to science majors without permission of major department.

Credit, 3. Mr. Livingston, Mr. Mulcahy.

125 (I), (II). THE PLANT KINGDOM (E).

A general survey of the morphology, reproduction, distribution and importance of the slime molds, bacteria, algae, fungi, lichens, liverworts, mosses, ferns and seed plants. Prerequisite, Botany 100 or Botany 101. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Mr. Davis, Mr. Bigelow, Mrs. Bigelow.

126 (I, 11). NEW ENGLAND FLORA (E).

Identification of local flora (vascular) with emphasis on terminology of fruits, leaves, flowers, etc. Prerequisite, Botany 100 or 101. 2- and 3-hour laboratory periods with lecture combined. Several field trips. Credit, 3. Mr. Ahles.

175 (I). GENETICS AND EVOLUTION (E).

Survey of the cell and those fundamental genetic principles which are the basis of evolution. Origin and history of organic evolution. Mechanisms of evolution. Intended for non-science majors. 3 class hours. Credit, 3. Mr. Stein.

211 (I). INTRODUCTORY PLANT PHYSIOLOGY.

Plant processes and their relation to the complex of activity constituting plant growth. Topics include water relations, photosynthesis, fat and protein synthesis, digestion, translocation and respiration. Prerequisites, Botany 100 or Botany 101, and at least one semester of Organic Chemistry. 3 class hours, 1 3-hour laboratory period.

Credit, 4. Mr. Gentile, Mr. Stern, Mr. Lockhart.

212 (II). PLANT METABOLISM.

A study of the chemical operation of plants, emphasizing the enzymatic processes involved in the synthesis and breakdown of the more important chemical constituents of plants. Prerequisites, Botany 211, Chemistry 160 or equivalent. 2 class hours, 1 4-hour laboratory period. Credit, 4. Mr. Stern.

215. PLANT GROWTH.

A study of the physiology, kinetics and energetics of plant growth. The growth of plant cells, whole plants, assemblages of plants, and plant productivity will be discussed. Prerequisites, Botany 211, one year of introductory chemistry, and one year of introductory physics. Courses in differential calculus, statistics, and/or biochemistry are recommended. 3 class hours.

Credit, 3. Mr. Lockhart.

221 (I). PLANT ECOLOGY.

Interrelationships between plants and their environment, with special emphasis on the structure and development of plant communities. Prerequisite, Botany 100 or Botany 101; Botany 126 and 211 recommended. 2 3-hour class-laboratory periods.

Credit, 3. Mr. Livingston, Mr. Mulcahy.

222. AUTECOLOGY.

Plant behavior in relation to the physical and biological environment, with emphasis on the ecology of individual plants. Prerequisites, Botany 211 and 221. Credit, 3. Mr. Livingston.

226. PLANT GEOGRAPHY.

Principles governing the development and natural distribution of plants and plant communities with special consideration of the vegetation of North America. Prerequisite, Botany 221; Botany 281 recommended. 3 class hours. Credit, 3. Mr. Livingston.

228. GENECOLOGY.

A study of ecological phenomena through the application of genetic concepts. The adaptation of individuals, populations, and communities as functional units. Prerequisite, Botany 240 or Zoology 240. Credit, 3. Mr. Mulcahy.

231 (II). MYCOLOGY.

Fungi, their life history and distribution, their significance in disease, their utilization by man. Prerequisite, Botany 125, or permission of instructor. 2 class hours, 1 3-hour laboratory period. Credit, 3. Mr. Bigelow, Mrs. Bigelow.

240 (I), (II). PRINCIPLES OF GENETICS.

Mechanisms of heredity in plants and animals, emphasizing transmission and action of genes, population genetics, and evolution. Prerequisites, Botany 100 or Botany 101, Zoology 101, Chemistry 112 or 114. 3 class hours.

Credit, 3. Mr. Rauch, Mrs. Shepard, Miss Stroup.

241 (I). PHYCOLOGY.

The phylogeny, taxonomy, morphology and ecology of the major group of the marine and fresh-water algae. Field work. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Wilce.

251 (II). THE ARCHEGONIATES.

The morphology, evolution and systematics of bryophytes, ferns and their allies. 2 class hours, 1 3-hour laboratory period.

Credit, 3. Mr. Schuster.

255. EXPERIMENTAL PTERIDOLOGY.

Many of the known physiological and genetical parameters of the pteridophyte life cycle will be integrated to give an overall view of the biology of these plants. The research potential of these organisms will also be stressed. Prerequisites, Botany 240 or Zoology 240, and Botany 211. Credit, 3. Mr. Klekowski.

261 (I). BIOLOGY OF LOWER PLANTS.

The use of fungi and algae as experimental organisms for investigations in physiology and genetics. Prerequisite, Botany 211, Zoology 360, or Chemistry 224. 2 class hours, 2 3-hour laboratories. Credit, 4. Miss Fultz.

270. CYTOGENETICS.

Emphasis on the correlation of genetic data with chromosome behavior, including an analysis of the mechanism of crossing over. Evolutionary considerations of changes in chromosome structure and number. Prerequisites, Botany 311 and Botany 240 or Zoology 240. 2 class hours, 1 3-hour laboratory period.

Credit, 3. Miss Stroup.

281 (II). INTRODUCTORY SYSTEMATICS.

The evolution and systematics of flowering plants, emphasizing families and their relationships. Prerequisite, Botany 125 or 126. 2 class hours, 1 3-hour laboratory period.

Credit, 4. Mr. Walker.

291 (I). PLANT ANATOMY AND HISTOLOGICAL METHODS.

Study of origin and structure of vegetative and reproductive organs of seed plants coordinated with exercises in preparation of stained slides for microscopic studies. Prerequisite, Botany 125, or permission of instructor. 2 class hours, 3 2-hour laboratory periods. Credit, 4. Mr. Bierhorst.

301 (I). MORPHOGENESIS.

The development of plant form and structure at the level of cells and organs. Illustrations drawn from controlled experiments on the contribution of internal and external factors. 2 class hours, 1 3-hour laboratory-discussion period. Credit, 3. Mr. Stein.

303, 304. PLANT MORPHOLOGY.

A systematic treatment designed to give the student a working knowledge of the life cycles of various plant taxa, of the dynamics of their evolution and of the interpretation of various morphological structures. Prerequisite, Botany 100 or permission of instructor. Credit, 4. Mr. Bierhorst.

311 (I). DEVELOPMENTAL PLANT CYTOLOGY.

Emphasis on development of plant cell walls, plastids and mitochondria; introduction to fine structure of cytoplasmic and nuclear components and ontogenetic and phylogenetic development of plant cell structures. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Staff.

335 (I). AQUATIC VASCULAR PLANTS.

Systematics, ecology and fundamental importance of aquatic plants. Designed for majors in Wildlife. Prerequisites, Botany 100, 126. 2 3-hour class-laboratory periods.

Credit, 1-3. Mr. Wilce.

385 (I), 386 (II). SPECIAL PROBLEMS.

Supervised problem work for qualified students. By arrangement. Credit, 1-3. Staff.

399. DEPARTMENTAL HONORS.

By arrangement. Staff.

Chemistry

Head of Department: Professor William E. McEwen. Professors Cannon, Carpio, Chien, Holmes, Rausch, Richason (Associate Head), Roberts, Siggia, Smith, Stein; Associate Professors Archer, Brandts, Cade, George, Lillya, MacKnight, McWhorter, Miller, Ragle, Stengle; Assistant Professors Barnes, Chandler, Collins, Curran, Oberlander, Olver, Rhodes, Rowell, Stidham, Williams, Zajicek; Instructors Bernasconi, Fessenden, Parkinson, Reed, Turner, Wynne.

The chemistry curriculum is currently under revision. Information may be obtained from Professor George Richason, the departmental Chief Adviser.

101 (I). GENERAL CHEMISTRY FOR NON-SCIENCE MAJORS (E, upon completion of 102).

The fundamental chemical laws and theories, with the object of giving the student a sound scientific training through a course in chemistry. 2 class hours, 1 2-hour quiz-demonstration.

Credit, 3. Mr. Richason and Staff.

102 (II). GENERAL CHEMISTRY: NON-SCIENCE MAJORS (E).

A continuation of Chemistry 101. Does not satisfy prerequisites for most advanced chemistry courses. 2 class hours, 1 quiz hour, 1 2-hour laboratory period. Credit, 3. Mr. Richason and Staff.

111 (I), 112 (II). GENERAL CHEMISTRY (E).

The fundamental chemical laws and theories, with the object of giving the student a sound scientific training through a course in chemistry. For engineers and other students planning to take advanced courses in chemistry. 2 class hours, 1 quiz hour, 1 2-hour laboratory period. Credit, 3. Mr. Richason and Staff.

113 (I), 114 (II). GENERAL INORGANIC CHEMISTRY (E).

The fundamental chemical laws and theories, including the elements of qualitative analysis. For students planning to major in chemistry and others for whom the course is a departmental requirement. Prerequisite, secondary school chemistry. 2 class hours, 2 3-hour laboratory periods.

Credit, 4. Mr. Richason and Staff.

127 (I, II). ANALYTICAL CHEMISTRY (E).

A broad look at the principles of analytical chemistry, for students not majoring in chemistry. Basic laboratory techniques and operations of quantitative analysis. Prerequisite, Chemistry 112 or 114. 2 lectures, 2 3-hour laboratory periods.

Credit, 4. Analytical Staff.

160 (I). ORGANIC CHEMISTRY (E).

For students whose major department does not require a year course in organic chemistry. Prerequisite, Chemistry 102 or 112. 3 class hours, 1 3-hour laboratory period.

Credit, 4. Organic Staff.

165 (I), 166 (II). ORGANIC CHEMISTRY FOR MAJORS.

261 (I), 262 (II). ORGANIC CHEMISTRY FOR NON-MAJORS.

Introduction to the chemistry of carbon compounds. Survey of the principal classes of organic compounds and their reactivities with emphasis on the relation between structure and reactivity. Prerequisite, Chemistry 112 or 114. Concurrent enrollment in Chemistry 167, 168 or 263, 264 is required. 3 class hours.

Credit, 3. Organic Staff.

167 (I), 168 (II). ORGANIC LAB FOR MAJORS.

263 (I), 264 (II). ORGANIC LAB FOR NON-MAJORS.

Application of the experimental techniques of organic chemistry to the preparation, purification and analysis of organic compounds. Prerequisite, concurrent enrollment in Chemistry 165, 166 or 261, 262. 1 3-hour laboratory period.

Credit, 1. Organic Staff.

210 (I). QUANTITATIVE CHEMICAL ANALYSIS.

A detailed study of the principles and practices of titrimetric and gravimetric analysis; separation methods; introduction to physical methods. Primarily for chemistry majors and others needing a more detailed treatment than is given in Chemistry 127. Prerequisite, Chemistry 114 and 166. 2 lectures, 2 4-hour laboratory periods.

Credit, 4. Analytical Staff.

213 (I). INSTRUMENTAL ANALYSIS.

The theory and practice of modern analyses utilizing optical, electrical, and thermal properties. Selected modern separation methods may also be included. Prerequisites, Chemistry 210, 286. 2 class hours, 1 4-hour laboratory period.

Credit, 3. Analytical Staff.

215 (I). THEORY OF ANALYTICAL PROCESSES.

A detailed consideration of analytical topics, such as chemical equilibrium, precipitate formation, chelating agents, multistage separation, etc., having general applicability in chemical investigations. Prerequisites, Chemistry 166 and 286. 3 class hours. (Laboratory optional, 1 extra credit.) Credit, 3. Analytical Staff.

216 (I, II). CHEMICAL MICROSCOPY.

Optics of the microscope, micrometry, microscopic study of fibers, crystals, physicochemical phenomena, qualitative analysis and an introduction to electron microscopy. Prerequisite: Chem 213 or permission of the instructor. 2 3-hour laboratory periods. *Credit, 2.* Mr. Roberts.

217 (I, II). MICROQUANTITATIVE ANALYSIS.

Quantitative determination of carbon, hydrogen, oxygen, nitrogen, sulfur, halogens and phosphorus. Both organic and inorganic compounds will be included in microgram scale analyses. Prerequisite: Chem 213 or permission of the instructor. 1 4-hour laboratory period. *Credit, 1.* Mr. Meade.

219 (I). ELECTRONICS INSTRUMENTATION FOR SCIENTISTS.

Laboratory oriented course designed for scientists which begins with electronic principles and leads through servo-systems, operational amplifiers, digital circuits, and other measurement devices. Prerequisite, one year of physics and permission of instructor. 1 class hour, 1 4-hour laboratory period. *Credit, 3.* Mr. Curran.

244 (II). RADIOCHEMISTRY.

The character of atomic nuclei, nuclear reactions, radiation and its detection, and techniques for the study and utilization of radionuclides. Prerequisite, Chemistry 127 or 210, or permission of instructor. 2 class hours, 1 3-hour laboratory period. *Credit, 3.* Mr. Richason.

246 (I, II). THEORETICAL INORGANIC CHEMISTRY.

A survey of theoretical aspects of inorganic chemistry chosen from such topics as electronic structure and its relation to periodic properties, chemical bonding, molecular structure, coordination chemistry, acid-base theory, non-aqueous systems, and reaction mechanisms. Prerequisite, Chemistry 285. 3 class hours. *Credit, 3.* Inorganic Staff.

247 (II). INORGANIC CHEMISTRY OF THE COMMON ELEMENTS.

A systematic consideration of the common elements and their compounds, based on the periodic relationships and modern concepts of structure and bonding. An optional two-credit laboratory will provide an introduction to inorganic laboratory techniques and practices. Prerequisite, Chemistry 246, or permission. 3 class hours (6 laboratory hours optional). *Credit, 3 (or 5).* Inorganic Staff.

269 (II). ADVANCED ORGANIC CHEMISTRY LABORATORY.

Continuation of Chemistry 168. Study of preparations involving special techniques and use of the literature of organic chemistry. Prerequisite, Chemistry 166, 168. Limited to Chemistry majors. 2 3-hour laboratory periods. *Credit, 2.* Organic Staff.

271 (II). ADVANCED ORGANIC CHEMISTRY.

An intensive survey of aliphatic and aromatic chemistry with emphasis on scope and limitations of reactions, mechanisms, and recent developments. Admission by permission of instructor. Prerequisite, one year of Organic Chemistry. 3 class hours. *Credit, 3.* Organic Staff.

272 (II). QUALITATIVE ORGANIC CHEMISTRY.

Identification of unknowns, both single and mixtures of organic compounds, by physical properties, reactions and preparation of derivatives. Admission by permission of instructor. Prerequisite, one year of Organic Chemistry. 2 class hours, 2 3-hour laboratory periods. *Credit, 4.* Organic Staff.

281 (I). ELEMENTARY PHYSICAL CHEMISTRY.

The basic principles of physical chemistry designed for students with a limited mathematical background. Not open to chemistry majors. Prerequisites, Chemistry 112 or 114; Physics 142; Mathematics 124. 3 class hours. *Credit, 3.* Physical Staff.

282 (II). ELEMENTARY PHYSICAL CHEMISTRY.

A continuation of Chemistry 281. 2 class hours, 1 3-hour laboratory period. *Credit, 3.* Physical Staff.

285 (I), 286 (II). PHYSICAL CHEMISTRY.

The fundamental theories and laws of physical chemistry. Prerequisites, Mathematics 186 or 174; Physics 142 or 162. Co-requisites, Chemistry 210 or 127. 3 class hours. *Credit, 3.* Physical Staff.

287 (I, II), 288 (I, II). PHYSICAL CHEMISTRY LABORATORY.

Experience in modern physico-chemical techniques. Prerequisites, Chemistry 210; Mathematics 186 or 174; Physics 142 or 162; or permission of instructor. Concurrent enrollment in Chemistry 285, 286. 1 4-hour laboratory period. *Credit, 2.* Physical Staff.

290 (II). ADVANCED PHYSICAL CHEMISTRY.

A survey of modern physical chemistry with emphasis on the fundamentals of quantum mechanics and statistical mechanics. For students not taking further advanced work in these areas. Prerequisite, Chemistry 286. 3 class hours. *Credit, 3.* Physical Staff.

295 (I). ADVANCED PHYSICAL CHEMISTRY.

Topics such as chemical thermodynamics, statistical mechanics, introductory quantum chemistry and theories of gases, liquids and solids. Prerequisite, Chemistry 286. 3 class hours. *Credit, 3.* Physical Staff.

381 (I). CHEMICAL LITERATURE.

Intended to give facility in the location of information of a chemical nature. Prerequisites, Chemistry 166, 286, and a reading knowledge of German, or permission of instructor. 1 class hour. *Credit, 1.* Mr. Oberlander.

388 (II). INTRODUCTION TO RESEARCH.

Admission only by permission of the department. Each student is assigned some special subject or problem in one of the several fields of chemistry. By arrangement. 10 laboratory hours. *Credit, 5.* Staff.

RELATED COURSES

BIOCHEMISTRY 120 (II). Introduction to Biochemistry.

BIOCHEMISTRY 220 (I). Elementary Biochemistry.

BIOCHEMISTRY 223 (I), 224 (II). General Biochemistry.

BIOCHEMISTRY 225 (I), 226 (II). General Biochemistry Laboratory.

Comparative Literature

Chairman of Program: Professor Wolfgang Fleischmann.
Assistant Professors Moebius, Pulc, Schroeder; *Instructors* Deaver, Levine, Miller.

These courses provide supporting work for students of literature. An undergraduate major in Comparative Literature is in the planning stage. Courses at the 200 level are offered for purposes of general education; readings are done in English translation. Courses at the 300 level require an easy reading knowledge of either French or German, unless otherwise specified in the course description.

201 (I, II). MODERN EUROPEAN LITERATURE I (C).

Currents in modern European drama and fiction, mirrored in the thematic and stylistic evolution of the theatre from Chekhov to Beckett and Genet, and in philosophical fiction concerned with re-evaluation of traditional values and the search for meaning through the modes of art and action. 3 class hours.

Credit, 3. Mr. Deaver, Mr. Moebius, Mr. Fleischmann.

202 (I, II). MODERN EUROPEAN LITERATURE II (C).

The development of psychological fiction in Europe since Dostoevsky, concentrating on the synthesis of the Bildungsroman, "development novel," and the Künstlerroman, "artist novel," which examine the background and mission of the intellectually superior and sensitive artist-type. 3 class hours.

Credit, 3. Mr. Deaver, Mr. Moebius, Mr. Fleischmann.

203 (I, II). THE EUROPEAN NOVEL: MAN AND SOCIETY (C). In English translation, a number of French, Spanish, German, Russian and English novels of the 17th to 20th centuries, in the context of the consciousness they reflect, describe, and transcend. 3 class hours.

Credit, 3. Mr. Fleischmann, Mr. Levine, Mr. Schroeder.

204 (I, II). CLASSICS OF EUROPEAN LITERATURE (C).

A critical reading of some major works from the earlier literatures of Europe in English translation, developing a critical awareness of dramatic, novelistic, and poetic genres; provides a background in the earlier literatures of Europe. 3 class hours.

Credit, 3. Mr. Beekman, Mr. Page.

211 (II). EUROPEAN LITERATURE OF THE MIDDLE AGES I (C).

Medieval, courtly, romance and lyric in translation from French, German, Italian, and Middle English. Close analysis of texts combined, wherever possible in the original language, with a study of the literary, social, and psychological conventions of courtly poetry. Consideration of the altered perspectives on those conventions which are expressed in late medieval poetry. 3 class hours.

Credit, 3. Mr. Schroeder.

212 (II). EUROPEAN LITERATURE OF THE MIDDLE AGES II (C).

Medieval allegory and drama in translation from Latin, French, Italian, and Middle English. The development, from the early Christian period, of the allegorical tradition and of the dramatic

tradition which evolved from it. Consideration of the medieval imaginative conventions which found their means of expression in allegory, and of the failure of those conventions in allegories and drama of the 14th century. 3 class hours.

Credit, 3. Mr. Schroeder.

231 (I). MODERN AFRICAN LITERATURE (C).

An introduction to the modern literature of Africa south of the Sahara, examining such questions as: the role of literature and the writer in an emergent country, the blending of Western and indigenous elements in a new literature, and the literary expression of color consciousness. 3 class hours.

Credit, 3. Mr. Cassirer.

241 (I). THE CHINESE LITERARY TRADITION: CONTEMPORARY CHINA I (C).

An introduction to continuity and change in 20th century Chinese fiction, drama, and poetry, including both Communist and non-Communist mainland Chinese literature. Review of the impact of Western literature on China and the resultant Chinese "Literary Renaissance." The relation between literature and politics in modern China. Special consideration of Chairman Mao Tse-tung's concept of literature as "Revolutionary Power" and of the role of the Red Guards in the Chinese Cultural Revolution. Reading, in English translation, will include Mao Tse-tung, Lu Hsiin, Lao-she, Pa Chin, Mao Tun, Kuo Mo-jio, Shen Ts'ung-wen, André Malraux, and Pearl Buck. 3 class hours.

Credit, 3. Mr. Miller.

242 (II). THE CHINESE LITERARY TRADITION: CLASSICAL CHINA II (C).

A general orientation in Chinese Classics from 600 B.C. to the end of the Sung dynasty (1279 A.D.). Selected readings, in English translation, of Confucian and Taoist literature and of the works of major Chinese poets. The role of Chinese verse and the Chinese written character in the development of Western poetry and cinema. Comparison of the translations and "Chinese" poems of such writers as Ezra Pound, Ernest Fenollosa, Amy Lowell, Arthur Waley, and Gary Snyder. 3 class hours.

Credit, 3. Mr. Miller.

243 (I). JAPANESE LITERARY TRADITION I (C).

Japanese literature to 1600. From the archaic and classical periods of Japanese literature, early Japanese court poetry, the development of prose forms, and the *Tale of Genji* will be read and discussed. Medieval literature will include the military tale, late classical and medieval court poetry and the linked verse, and the Nō theatre. Emphasis on relating the development of Japanese literature to the overall development of Japanese civilization. 3 class hours.

Credit, 3. Mr. Naff.

244 (II). JAPANESE LITERARY TRADITION II (C).

Japanese literature from 1600 to the present. The later linked verse and Haiku traditions, the rise of mass literacy in the 17th century and the fiction and drama produced as a result. The literary implications of the successful and productive synthesis of the Japanese and Western intellectual and artistic traditions that have developed during the past hundred years. Emphasis on the development of the modern Japanese novel. 3 class hours.

Credit, 3. Mr. Naff.

251 (I). CHINESE LITERARY GENRES: POETRY AND MYSTICISM I (C).

A critical reading of Chinese poetry and philosophical materials. Emphasis on Chinese mystical literature together with paradigms chosen from Western poetry and mystical literature. Readings, in English translation, include the *I Ching* (*Book of Changes*), the *Tao Te Ching* (*the Way and Its Power*), works of the Chinese Taoist poet, Chuang-tzu, and selections from the poetry of Blake and Yeats and the writings of St. John of the Cross and St. Teresa. 3 class hours
Credit, 3. Mr. Miller.

252 (II). CHINESE LITERARY GENRES: VERNACULAR LITERATURE II (C).

The development of Chinese fiction and drama from the medieval storyteller tradition through the modern period of literary symbolism. Chinese concepts of the novel and theatre; examination of the relation between erotic and allegoric literature in the evolution of Chinese society. Readings, in English translation, include *Dream of the Red Chamber* (*Hung-lou meng*), *All Men Are Brothers* (*Shui-hu chuan*), *Monkey* (*Hsi-yu chi*), *Golden Lotus* (*Chin p'ing mei*), and *Romance of the West Chamber* (*Hsi-hsiang chi*). 3 class hours.
Credit, 3. Mr. Miller.

291 (II). MYTH AND LITERATURE (C).

The structure and role of myth as reflected in representative works of literature. Readings of Continental literature in English translation. 3 class hours.
Credit, 3. Mr. Moebius.

321 (I). RENAISSANCE PERSPECTIVES (C).

The tradition of the Middle Ages, the heritage of the Renaissance—the rhetoric of writing and the arts of reading and interpretation as handed down to the Renaissance. Examples and texts from English, French, Italian, and Latin may be read in translation. An easy knowledge of one of the following is required: Latin, Italian, or French. 3 class hours.
Credit, 3. Mr. Levine.

322 (II). THE SHAPE OF THE RENAISSANCE (C).

Diversity and changes of literary style in the 15th and 16th centuries, with emphasis upon cultural continuity, and with an examination of critical method. Examples and texts from English, French, Italian, Latin and Spanish may be read in translation. An easy reading knowledge of one of the following is required: Latin, Italian, or French. 3 class hours.
Credit, 3. Mr. Levine.

331 (I). THE ENLIGHTENMENT (C).

Characteristic themes, ideas and attitudes in 18th century European literature. Focus on major representatives of the Age of Reason such as Pope, Swift, and Johnson in England; Montesquieu, Voltaire, and Diderot in France; Wieland and Lessing in Germany. 3 class hours.
Credit, 3. Mr. Fleischmann.

341 (II). ROMANTICISM (C).

The Western Romantic movement as exemplified by its principal figures from the age of Rousseau to 1850. 3 class hours.
Credit, 3. Mr. Page.

342 (I). FROM IDEALISM TO REALISM (C).

Main currents in the post-romantic literature of the 19th century as expressed by such figures as Heine, Flaubert, and Hardy. 3 class hours.
Credit, 3. Mrs. Pulc.

351 (II). SYMBOLISM (C).

The development of symbolism in the 19th and 20th century poetry of France, (Baudelaire, Verlaine, Mallarmé, Rimbaud), Germany (George, Hofmannsthal, Rilke), and England (Yeats, Pound, Eliot). 3 class hours.
Credit, 3. Mr. Fleischmann.

352 (I). MODERN DRAMA (C).

Currents in Western drama since Ibsen: naturalism; symbolism; neoromanticism; expressionism; folk drama and fantasy; epic realism; the "grotesque" and "absurd" theatre. 3 class hours.
Credit, 3. Mr. Moebius.

361 (II). THE CONTEMPORARY EUROPEAN NOVEL (C).

Ideological commitments and innovations in the novels of Proust, Gide, Camus; Mann, Hesse, and Kafka; the Bloomsbury Group. 3 class hours.
Credit, 3. Mr. Deaver.

371. EUROPEAN EPIC POETRY (C).

Literary analysis of major classical and Renaissance epics (by Homer, Virgil, Dante, Milton) and three related heroic poems ("Gilgamesh," "Beowulf," "Chanson de Roland"), with emphasis on their intrinsic qualities as works of art. Specific epic techniques and the general epic tradition related to other genres and literary problems; examination of the sources of many later patterns and themes. 3 class hours.
Credit, 3. Mr. Hunt.

375 (II). ANGLO-GERMAN LITERARY RELATIONSHIPS SINCE 1750 (C).

Subjects and problems common to English and German literature since the middle of the 18th century with some attention to German-American literary relationships. By permission, may be counted for major credit in English and German. 3 class hours.
Credit, 3. Mr. Fleischmann.

Economics

Head of Department: Professor James K. Kindahl, Professors Barkin, Gamble, Howard, Morris, Seligman, Smith; Associate Professors Blackman, Eagly, Holesovsky; Assistant Professors Aitken, Best, Gale, Gunderson, Hinckley, Leonard, Love, Ray, Trezy, Tsao, Wright; Instructors Gordon, Kane; Lecturers Chandran, Moran.

Economics majors must take Economics 125, 126, 201 and 214, and at least 12 additional credits from the economics curriculum. It is recommended that not more than 18 additional junior, senior credits come from economics, business administration and/or agricultural economics.

At least two semesters of upper division work in other social sciences are recommended.

At least two semesters of mathematics are strongly recommended for economics majors (Math 113 or 123 or their equivalent). Students contemplating graduate study in Economics or Business Administration are advised to take Mathematics at least through introductory calculus (Math 123 and 124) and linear algebra.

The pass-fail grading option in economics courses is open to all non-majors subject only to the restrictions imposed by the student's major department, and the University. Economics majors are advised not to exercise the pass-fail option in upper division courses that are presented to fulfill the requirements of the economics major.

125 (I) (II). ELEMENTS OF ECONOMICS (D).

An introduction to basic principles which govern the behavior of the American economy, with emphasis on the macroeconomic issues of full employment, price stability and economic growth.

Credit, 3.

126 (I), (II). PROBLEMS OF THE NATIONAL ECONOMY (D). Introductory analysis of resource allocation and income distribution in the American economy. Problems of international trade, underdeveloped nations, and the Soviet economy. *Credit, 3.*

127 (I), (II). HONORS SECTION OF ECONOMICS 125. Permission of instructor.

128 (I), (II). HONORS SECTION OF ECONOMICS 126. Permission of instructor.

201 (I) (II). INTERMEDIATE MICROECONOMIC THEORY (D). Microeconomic analysis of consumers, firms, industries, and markets; rational decision making under conditions of certainty; balancing forces in a free enterprise economy. *Credit, 3. Staff.*

211 (I). MONEY, BANKING AND CREDIT (D). The development and operation of the monetary and banking systems of the United States; problems of achieving full employment and price stability through monetary controls. *Credit, 3. Mr. Hinckley.*

212 (II). MONEY, INCOME AND MONETARY POLICY (D). The relationship among money, income and monetary policy. An examination of the relationships among individuals, banks, money markets, governments and central banks. Prerequisites, either Economics 211 or Finance 210. *Credit, 3. Mr. Hinckley.*

214 (I), (II). MACROECONOMIC THEORY AND BUSINESS CYCLES (D).

Formulation and empirical testing of static and dynamic theories of aggregative income, employment, and prices with special reference to the business cycle, growth, and economic forecasting. *Credit, 3.*

221 (I). THE INTERNATIONAL ECONOMY (D). A historical and analytical introduction to the study of international institutions, trade, finance and policy. Current problems and recent developments are given extensive treatment. *Credit, 3. Mr. Aitken.*

222 (II). INTERNATIONAL TRADE AND ECONOMIC POLICY (D).

Intermediate theory of international trade, including the analysis of the balance of payments mechanism, pure non-monetary theory and its application to problems of commercial policy. Prerequisite, Economics 125. *Credit, 3. Mr. Aitken.*

231 (I), (II). SOCIAL CONTROL OF BUSINESS (D).

The formal and informal methods and efforts to maintain, supplement and moderate competition, and the substitution of regulation and public enterprises for competition.

Credit, 3. Mr. Howard, Mr. Gale.

232 (I), (II). THE STRUCTURE OF AMERICAN INDUSTRY (D). Business enterprise, market competition, and economic development in American industries. The social effectiveness of industries analyzed through measures of industrial structure and market performance. *Credit, 3. Mr. Gale.*

241 (I). LABOR PROBLEMS (D).

Background of the labor movement and problems involved in the management-labor relationship and the efforts of management, unions and government to solve them.

Credit, 3. Mr. Blackman, Mr. Love.

242 (II). LABOR LAW AND LEGISLATION (D). Economic effects and historical survey of Federal and state laws and an analysis of important court decisions. Prerequisites, Economics 241, or permission of instructor.

Credit, 3. Mr. Blackman, Mr. Love.

251 (I). MATHEMATICAL METHODS IN ECONOMICS.

The applications of various mathematical concepts and techniques in macroeconomic and microeconomic analysis. Special emphasis is placed on the design and interpretation of mathematical models of economic phenomena. Prerequisites, Economics 126, Mathematics 111, 112, or permission of instructor. *Credit, 3.*

252 (II). ECONOMETRICS.

The application of mathematical and statistical methods to economic theory. Special emphasis on the application to both microeconomic and macroeconomic policy issues. Permission of instructor. *Credit, 3.*

261 (I). EUROPEAN ECONOMIC EVOLUTION (D).

Evolution of economic organization in agriculture, industry and commerce; the surrounding social and institutional life. Prerequisites, History 100 and 101, or permission of instructor. *Credit, 3. Mr. Eagly.*

262 (II). AMERICAN ECONOMIC HISTORY (D).

An analytical approach to structural change, economic growth, and the development of market institutions in the United States from colonial times to the present. *Credit, 3. Mr. Gunderson.*

266 (I). ECONOMIC DEVELOPMENT (D).

Economic problems of underdeveloped countries and the policies necessary to induce growth. Individual projects will be required. *Credit, 3. Mr. Morris.*

267 (II). LATIN AMERICAN ECONOMIC DEVELOPMENT.

Development of the Latin American economies with emphasis on the central problems of the various economies and proposed economic programs. Prerequisite, Economics 266 or permission of instructor. *Credit, 3.*

271 (I). **COMPARATIVE ECONOMIC SYSTEMS (D).**
Evaluation of the performance of alternative economic systems in theory and practice. Problems of planning in the advanced economies of the U.S., Western Europe, and Soviet area.

Credit, 3. Mr. Holesovsky.

272 (II). **THE SOVIET ECONOMY (D).**
Resource allocation through centralized planning in the Soviet economic system. A case history of economic development. Current problems of economic reform.

Credit, 3. Mr. Holesovsky.

281 (I). **REGIONAL ECONOMICS (D).**
The process of regional economic growth; location theory and basic techniques of regional analysis; public and private area development programs.

Credit, 3.

282 (II). **URBAN ECONOMICS (D).**
The structure of the urban economy; goals, processes, problems and policy in urban economic development.

Credit, 3.

301 (I). **DECISION THEORY IN ECONOMICS.**
The modern theory of rational decision-making under conditions of uncertainty, risk, and conflict. Applications to the theory of the firm and the theory of oligopoly. Prerequisites, Economics 126, one year of college mathematics, or permission of instructor.

Credit, 3.

304 (II). **FINANCIAL ASPECTS OF ECONOMICS (D).**
The application of modern flow-of-funds analysis to the financial behavior of the various economic sectors. Special emphasis is placed on capital theory, and on rational planning for business decisions in regard to capital budgeting and financing.

Credit, 3.

306 (I). **DEVELOPMENT OF ECONOMIC THOUGHT.**
The evolution of contemporary theory from its classical beginnings; neoclassicism and its chief variants; dissenters Marx, German historical school, Veblen. Emphasis is placed on the relation of economic thought to other kinds of social theories.

Credit, 3. Mr. Eagly.

312 (I). **PUBLIC FINANCE (D).**
Principles of public revenues and expenditures; systems and problems of taxation; use of taxes, expenditures, debt policy to provide full employment; economic growth and price stability.

Credit, 3. Mr. Ray

314 (II). **STATE AND LOCAL PUBLIC FINANCE.**
State and local government revenue and expenditure programs. Individual research projects relating to Massachusetts or surrounding states are required.

Credit, 3. Mr. Ray.

341 (II). **ECONOMIC SECURITY (D).**
Public and private programs to prevent or alleviate economic insecurity, including poverty, substandard incomes and economic contingencies.

Credit, 3. Mr. Blackman, Mr. Love.

362. **TECHNOLOGY IN WESTERN CIVILIZATION.**
Origins and impact of the industrial revolution, technological changes on work and society. Social and economic effects of automation.

Credit, 3. Mr. Gunderson, Mr. Seligman.

391 (I), 392 (II). **SEMINAR.**

Research in economic theory, problems of labor, commerce, and industry. If desirable, some other economic study may be substituted. Prerequisite, Economics 126. 1 or 2 2-hour conferences.

Credit, 1-3.

RELATED COURSES

AGRICULTURAL AND FOOD ECONOMICS 352.

Agricultural Policy.

AGRICULTURAL AND FOOD ECONOMICS 373. Resource and Conservation Economics.

AGRICULTURAL AND FOOD ECONOMICS 381. International Agricultural Development.

English

Head of Department; Professor Joseph Frank. Professor and Associate Provost Allen; Professors Alspach, Barnard, Brogan, Campbell, Chametzky, Clark, Copeland, Creed, Emerson, Gibson, Golden, Helming, Kaplan, Koehler, Langland, Mitchell, O'Donnell, B. Spivack, Varley, Weston; Visiting Professors Cuomo and Ford; Associate Professor and Associate Head of Department Hofer; Associate Professors Aczel, Barron, Berlin, Cheney, Clayton, Duckert, Fedler, Haven, J. Hicks, Kinney, McCarthy, Page, Plumstead, Porter, Rudin, Sanders, Silver, Tucker, Williams; Part-time Associate Professor C. Spivack; Assistant Professors Aho, Ashton, Bagg, Beaty, Cameron, Collins, L. Edwards, Freeman, French, Gallo, Gozzi, Hogan, Horrigan, J. A. Hunt, J. W. Hunt, Junkins, Keefe, Leheny, Lowance, Lyons, Mariani, Meckier, Moran, Nelson, Noland, Paroissien, Poletta, Powers, Quick, Raymond, Saagpakk, R. C. Sharp, Swaim, Teunissen, Thelwell, Turner; Assistant Professor of English and Comparative Literature Schroeder; Part-time Assistant Professors P. Hicks and B. Hunt; Instructors Bialas, Carlisle, Current, Diamond, DuBois, P. Edwards, Grahame, Harris, Jenkins, Louis, Oppenheim, Sitter; Part-time Instructors Gutschera and Stelzner; Lecturers Bell, Lesser, Mayer; Part-time Lecturers Allan, Berkowitz, Dunn, Kenseth, R. M. Sharp, C. K. Smith, H. Smith, Terry, Zemelman; Visiting Lecturers Benjamin, Donaldson, Guellal.

All students in baccalaureate programs of the University must complete the freshman and sophomore requirements in English. The freshman requirement is successful completion of 111 and 112, or 113. Students in the College of Arts and Sciences may fulfill the sophomore requirement by completing, in order, any two-course sequence of sophomore English courses, or an appropriate two-course sequence in Comparative Literature, or an appropriate two-course sequence in a single foreign language in the original tongue. The English sequences are 125 (or 127 or 135) and 126 (or 128 or 136) and the year courses

151–152, and 153–154. The Comparative Literature courses are 201 or 202 (not both) and 203 or 204 (not both). The foreign language sequences are French 161–162, German 277–278, Italian 161–162, and Spanish 161–162. Students not enrolled in the College of Arts and Sciences must meet the sophomore literature requirements of their respective colleges and schools.

Students majoring in English must take 1) one period course in English literature before 1800 and 2) three of the following four options: a) one course that has as its primary concern the study of the English language, b) one course in the works of Shakespeare, c) one course that studies intensively a single major British or American author, d) one course in the development of a literary genre such as tragedy, comedy, satire, lyric poetry, the novel. The student should elect his remaining six English courses and appropriate courses in other departments, including University core requirements and electives, to provide himself a coherent unit of study that accords with his own needs and interests. The Department publishes a booklet that suggests a variety of such correlated programs.

An English major may take no more than 30 hours of upperclass English courses except to the extent that he earns credits beyond the 120 hours required for graduation. Honors theses may be included in or excluded from the 30-hour total at the writers' discretion. The student may count in the 30 hours required for the major up to six credits for any upperclass course in Comparative Literature, or in any foreign literature read in the language or in translation, except for a course elected to fulfill the Sophomore literature requirement; any upperlevel course in Journalistic Studies or in Linguistics; and any upperlevel course in Speech primarily concerned with language or literature. Furthermore, upon presentation to the Chief English Adviser of sufficient justification, the student may obtain permission to count other courses not here included. A quality-point average of 2.0 or better must be maintained in all upperclass courses which fulfill the English major.

111, 112. ENGLISH COMPOSITION.

Training in language and composition. The emphasis in 111 is on kinds of expository prose; in 112, on critical reading of imaginative literature. 2 class hours. *Credit, 2.*

113 (I). SPECIAL FRESHMAN COMPOSITION.

For students who are exempted from English 111. 2 class hours. *Credit, 2.*

125 (I) (II), 126 (I) (II). MASTERPIECES OF WESTERN LITERATURE.

A study of selected masterpieces, from Homer and the Bible to James Joyce or Robert Frost. The course aims to enrich the student's appreciation of literary values and develop his understanding of abiding human issues. Prerequisite, English 112 or

113. English 125 or 127 is prerequisite to English 126 or 128. These courses may be chosen as fulfillments of the sophomore literature requirement. They are prerequisite to elective courses in the Department, except that an elective course may be taken concurrently with English 126 or 128. 3 class hours. *Credit, 3.*

127 (I) (II), 128 (I) (II). SPECIAL COURSE IN MASTERPIECES OF WESTERN LITERATURE.

A searching study of the texts read in English 125, 126, for students who are superior in reading and literary analysis; for students who have taken English 113, or are otherwise recommended. English 125 or 127 is prerequisite to English 126 or 128. These courses may be counted as fulfillments of the sophomore literature requirement. They are prerequisite to elective courses in the Department, except that an elective course may be taken concurrently with English 128. 3 class hours. *Credit, 3.*

135 (I) (II), 136 (I) (II). MASTERPIECES OF WESTERN LITERATURE.

The same as 125, 126 as to content, prerequisites, concurrent courses, and credit, but conducted in weekly evening sessions to facilitate the discussion method.

151 (I), 152 (II). FORMS AND SOURCES OF MODERN LITERATURE: EPIC AND NOVEL.

Readings from the ancient epic to the contemporary novel, with discussion of literary forms and themes. Materials will be drawn mainly from Western culture, with concentration on differing narrative techniques used by such authors as Homer, Cervantes, Fielding, Joyce, and John Barth. The student must elect both semesters of this two-semester course in sequence. If this sequence is chosen to fulfill the sophomore literature requirement, it is to be regarded as prerequisite to elective courses in the Department, except that an elective course may be taken concurrently with English 152. 3 class hours. *Credit, 3.*

153 (I), 154 (II). FORMS AND SOURCES OF MODERN LITERATURE: DRAMA AND LYRIC.

Readings in drama and lyric from ancient to contemporary times, drawn mainly from the Western tradition. An examination of dramatic and poetic techniques and their possible interworkings, in such authors as Sophocles, Shakespeare, Browning, Yeats, Eliot, O'Neill, Theodore Roethke, and Edward Albee. The student must elect both semesters of this two-semester course in sequence. If this sequence is chosen to fulfill the sophomore literature requirement, it is to be regarded as prerequisite to elective courses in the Department, except that an elective course may be taken concurrently with English 154. 3 class hours. *Credit, 3.*

201 (I), (II). MAJOR BRITISH WRITERS (C).

A selection of leading British writers from Chaucer to Dryden (but excluding Shakespeare). 3 class hours. *Credit, 3.*

202 (I), (II). MAJOR BRITISH WRITERS (C).

A selection of leading British writers from Pope to T. S. Eliot; to follow English 201. 3 class hours. *Credit, 3.*

- 202 (I), (II). THE ENGLISH BIBLE AS LITERATURE (C).
The several main genres of Biblical literature in their historical setting with attention to the principles of interpretation; the literary influence of the Authorized Version. 3 class hours. *Credit, 3.*
- 205 (II). GREEK CLASSICS (in translation) (C).
Homer, lyric poetry, the major dramatists, selected dialogues of Plato, Thucydides, and their relations to the classical tradition in English literature. 3 class hours. *Credit, 3.*
- 216 (I), (II). CHAUCER (C).
The major works, especially *Troilus* and selected *Canterbury Tales*, as combinations of medieval art and thought with pre-Renaissance motifs and Chaucer's genius for realism. 3 class hours. *Credit, 3.*
- 221 (I). SHAKESPEARE (C).
Examination of Shakespeare's dramatic art and leading ideas through a careful study of approximately a dozen plays. 3 class hours. *Credit, 3.*
- 222 (II). SHAKESPEARE (C).
Follows the same method as English 221 but with a different group of plays. Either semester or both may be taken for credit. 3 class hours. *Credit, 3.*
- 225 (I). SIXTEENTH CENTURY ENGLISH LITERATURE (C).
Selections from the non-dramatic literature, both prose and poetry, of the early English Renaissance through the Age of Elizabeth, including works by such writers as Skelton, Wyatt, Surrey, More, Gascoigne, Spenser, Sidney, Raleigh, Marlowe, and Shakespeare. Emphasis on the rise of humanism. 3 class hours. *Credit, 3.*
- 226 (II). ELIZABETHAN AND JACOBAN DRAMA (C).
Non-Shakespearean dramatists of the English Renaissance. A study of the major plays of Marlowe, Jonson, Beaumont, Fletcher, Tourneur, Webster, and Ford. 3 class hours. *Credit, 3.*
- 233 (I), (II). SEVENTEENTH CENTURY ENGLISH LITERATURE (C).
Selections from the poetry and prose of the late Renaissance in England, including works by such authors as Donne, Jonson, Browne, Burton, Marvell, and Milton. Emphasis on the challenge of the new science to the traditional humanism. 3 class hours. *Credit, 3.*
- 236 (I), (II). MILTON (C).
Development of the mind and art of Milton as a figure of the English Reformation and the late Renaissance, with emphasis on *Paradise Lost*. 3 class hours. *Credit, 3.*
- 238 (I). DRAMATIC LITERATURE OF THE RESTORATION AND THE EIGHTEENTH CENTURY.
Approximately twenty works illustrating themes and techniques of Restoration comedy, sentimental drama, and the heroic play, with emphasis on Dryden, Wycherley, Congreve, and Sheridan. 3 class hours. *Credit, 3.*

- 241 (I). ENGLISH LITERATURE OF THE EIGHTEENTH CENTURY (C).
The literature of the Augustan Age, with special emphasis on the writings of Swift and Pope. 3 class hours. *Credit, 3.*
- 242 (II). ENGLISH LITERATURE OF THE EIGHTEENTH CENTURY (C).
The literature of the later eighteenth century, with special emphasis on the Johnson Circle. A continuation of English 241 but may be elected independently. 3 class hours. *Credit, 3.*
- 243 (I), (II). THE ENGLISH NOVEL FROM DEFOE THROUGH AUSTEN (C).
The reading and discussion of significant representative novels, including works of such authors as Richardson, Fielding, Sterne, and Smollett. 3 class hours. *Credit, 3.*
- 251 (I). THE ROMANTIC POETS (C).
The Romantic Movement as revealed in the poetry of Wordsworth, Coleridge, and the other early Romantics. 3 class hours. *Credit, 3.*
- 252 (II). THE ROMANTIC POETS (C).
The Romantic Movement, with particular attention to Byron, Shelley, and Keats. 3 class hours. *Credit, 3.*
- 253 (I), (II). THE ENGLISH NOVEL FROM SCOTT THROUGH HARDY (C).
The reading and discussion of significant representative novels, including works of such authors as Dickens, Thackeray, the Brontës, Eliot, and Hardy. 3 class hours. *Credit, 3.*
- 255 (I). ENGLISH PROSE OF THE ROMANTIC PERIOD (C).
The techniques and ideas of the chief prose writers (from 1798 to 1837), including Wordsworth, Coleridge, Lamb, Hazlitt, DeQuincey, and the early Carlyle. 3 class hours. *Credit, 3.*
- 256 (II). ENGLISH PROSE OF THE VICTORIAN PERIOD (C).
The chief Victorian prose writers (from 1837 to 1900), including Macaulay, Carlyle, Newman, Arnold, Mill, Ruskin, Huxley, and Pater. 3 class hours. *Credit, 3.*
- 259 (I), (II). VICTORIAN POETRY (C).
The chief poets from 1837 to 1900, with emphasis on Tennyson, Browning, Arnold, and the Pre-Raphaelite Movement. 3 class hours. *Credit, 3.*
- 261 (I). THE MODERN NOVEL: 1890-1930 (C).
The expanding form of the novel and increasing interest in social causes as exhibited in some twelve novels. 3 class hours. *Credit, 3.*
- 262 (II). THE MODERN NOVEL: 1930-1960 (C).
An analytical presentation of some twelve novels. A continuation of English 261 but may be elected independently; no English major may, however, elect both English 261 and English 262. 3 class hours. *Credit, 3.*

263 (II). MODERN BRITISH AND AMERICAN DRAMA (C). Representative dramatists since the late nineteenth century, including Shaw, O'Casey, O'Neill, Williams, and others. Emphasis on changing trends in twentieth-century dramatic art. 3 class hours. *Credit, 3.*

264 (I). MODERN EUROPEAN DRAMA (in translation) (C). Major modern dramatists beginning with Ibsen and including Chekhov, Pirandello, Strindberg, Giraudoux, and others. Emphasis on comparative currents in various European nations. 3 class hours. *Credit, 3.*

265 (I). TWENTIETH-CENTURY LITERATURE OF IRELAND IN ENGLISH (C). Nineteenth-century background; the Irish Renaissance; such major figures as Yeats, Synge, Joyce, and O'Casey; recent and contemporary writing. 3 class hours. *Credit, 3.*

266 (I), (II). MODERN POETRY (C). An analysis of twentieth-century poetry to 1945 developing from such authors as Hardy, Hopkins, Whitman, and Emily Dickinson. 3 class hours. *Credit, 3.*

267 (I), (II). CONTEMPORARY POETRY (C). Poetry in English since 1945. 3 class hours. *Credit, 3.*

271 (I). EARLY AMERICAN LITERATURE (C). Significant writing from the Puritan, Colonial, and Federalist periods in American literature. Authors include Edward Taylor, Cotton Mather, Jonathan Edwards, John Woolman, Benjamin Franklin, Charles Brockden Brown, Philip Freneau, and Washington Irving. 3 class hours. *Credit, 3.*

272 (II). AMERICAN POETRY (C). American poetry from 1800 to the emergence of a modern style early in the twentieth century. 3 class hours. *Credit, 3.*

273 (I). NINETEENTH-CENTURY AMERICAN LITERATURE (C). An overview of significant productions in expository prose, fiction, and poetry, with attention to the emergence of an American literature. 3 class hours. *Credit, 3.*

274 (II). TWENTIETH-CENTURY AMERICAN LITERATURE (C). Movements, modes, and representative voices in prose, fiction, and poetry. A continuation of English 273, but may be elected independently. 3 class hours. *Credit, 3.*

275 (I), (II). MAJOR AMERICAN WRITERS (C). Emerson, Hawthorne, James, and any of the following by announcement each semester: Howells, Adams, Dos Passos, Lewis, Anderson, Fitzgerald, Hemingway. 3 class hours. *Credit, 3.*

276 (I), (II). MAJOR AMERICAN WRITERS (C). Thoreau, Melville, Whitman, and any of the following by announcement each semester: Cooper, Poe, Dickinson, Twain, Crane, Dreiser, Faulkner, Wolfe. 3 class hours. *Credit, 3.*

280 (I), (II). INTRODUCTION TO FOLKLORE (C). An exploration of the subject, beginning with the ballad as the nucleus of other folklore genres. 3 class hours. *Credit, 3.*

281 (II). AMERICAN FOLKLORE (C). Oral traditions in America, with special emphasis on surviving British lore, American Indian lore, Negro lore, and recent folk materials. 3 class hours. *Credit, 3.*

282 (I). LITERARY CRITICISM: CLASSIC AND NEO-CLASSIC (C). An introduction to literary criticism; chief emphasis on the major philosophical critics from Plato and Aristotle to the nineteenth century. 3 class hours. *Credit, 3.*

283 (II). MODERN LITERARY CRITICISM (C). An examination and application of theories and techniques of modern criticism, with special emphasis on the twentieth century. 3 class hours. *Credit, 3.*

312 (I), (II). HISTORY OF THE ENGLISH LANGUAGE. The development of English, including a study of vocabulary and usage levels, grammars, and dictionaries. Special attention to matters crucial to the teaching of English in secondary schools. 3 class hours. *Credit, 3.*

321 (I). STRUCTURE OF MODERN ENGLISH. Introduction to applied English linguistics; sounds, forms, and word-order of modern Standard American English; modern grammatical theory. 3 class hours. *Credit, 3.*

323 (II). THE STUDY OF THE NATIVE LANGUAGE. Historical backgrounds for the teaching of English; comparative analysis of modern theories of grammar; the uses of English; dialect and register; the language of literature. 3 class hours. *Credit, 3.*

331 (I), (II). TECHNICAL WRITING. For majors in engineering. A course in factual and inductive exposition, with special emphasis upon research, federal, and industrial reports. 2 class hours. *Credit, 2.*

334 (II). ADVANCED TECHNICAL WRITING. Case studies in engineering and industrial reporting and in the writing of technical and professional articles. Prerequisite, permission of the instructor at pre-registration. 3 class hours. *Credit, 3.*

337 (I), (II). ADVANCED EXPOSITORY WRITING. The writing of informative prose in the forms expected in the students' major fields: reports, articles, essays. Prerequisite, permission of the instructor at pre-registration. 3 class hours. *Credit, 3.*

339 (I), (II). ARTICLE WRITING. Magazine journalism combined with instruction in the writing of feature or magazine articles. Prerequisite, permission of the instructor at pre-registration. 3 class hours. *Credit, 3.*

341 (I), (II). CREATIVE WRITING. Intensive practice in writing prose fiction, with some attention to other forms, supplemented by discussion of ideas and techniques in contemporary literature. Prerequisite, permission of instructor at pre-registration. 3 class hours. *Credit, 3.*

345 (I or II as enrollment warrants). CREATIVE WRITING.
A continuation of English 341, with emphasis upon fiction. Prerequisite, permission of the instructor at pre-registration. 3 class hours. *Credit, 3.*

346 (I or II as enrollment warrants). CREATIVE WRITING.
A continuation of English 341, with emphasis upon poetry. Prerequisite, permission of the instructor at pre-registration. 3 class hours. *Credit, 3.*

347 (I or II as enrollment warrants). CREATIVE WRITING.
A continuation of English 341, with emphasis upon drama. Prerequisite, permission of the instructor at pre-registration. 3 class hours. *Credit, 3.*

Note: English 345, 346, and 347 may be repeated for an additional 3 credits.

380 (I), (II). ASPECTS OF LITERATURE (C).
An aspect of literature in English, both British and American, including literary movements, the relations of literature to particular cultural developments, and thematic criticism. 3 class hours. *Credit, 3.*

381 (I), (II). ASPECTS OF BRITISH LITERATURE (C).
An aspect of British literature. The specific subject is announced at pre-registration. 3 class hours. *Credit, 3.*

382 (I), (II). INDIVIDUAL BRITISH AUTHORS (C).
An intensive study of one or two British authors. The specific authors will be announced at pre-registration. Possible authors: Spenser; Carlyle; Tennyson and Arnold; Dickens; Shaw and Joyce. 3 class hours. *Credit, 3.*

383 (I), (II). SIGNIFICANT THEMES IN AMERICAN LITERATURE (C).
A study of an aspect of American Literature. The specific subject will be announced at pre-registration. Possible topics: the West in American Literature; the Adamic Theme; New England Transcendentalism; Literary Naturalism. 3 class hours. *Credit, 3.*

384 (I), (II). INDIVIDUAL AMERICAN AUTHORS (C).
An intensive study of one or two American authors. The specific authors will be announced at pre-registration. Possible authors: Twain and James; Hawthorne and Melville; Faulkner; Hemingway and Fitzgerald. 3 class hours. *Credit, 3.*

385 (I), 386 (II). INDEPENDENT STUDY AND RESEARCH.
Individual work under staff supervision for well-qualified juniors and seniors. Prerequisite, consent, at pre-registration, of the staff member who is to supervise. *Credit, 3.*

390 (I), 391 (II). SEMINAR.
Normally there are several seminars each semester. Topics and instructors will be announced at pre-registration. For majors, but open to others. Prerequisite, permission of the instructor at pre-registration. 3 class hours. *Credit, 3.*

393 (I) or (II). WRITING SEMINAR.
Writing for publication and training in editing related to professional and to University student publications. Prerequisite, permission of the instructor at pre-registration. 2 class hours, 1 laboratory period. *Credit, 3.*

Geology and Geography

Chairman of Department: Professor Randolph W. Bromery. Professors Farquhar, Hartshorn, Smith; Associate Professors Hayes, Jaffe, McGill, Motts, Pitrat, Robinson, Webb; Assistant Professors Hall, Nelson; Instructor Rice.

Geography Faculty: In charge of program: Associate Professor Terence Burke; Assistant Professors Nostrand, Wilkie; Instructor Hafner.

GEOLOGY

101 (I), (II). PHYSICAL GEOLOGY (E).
The nature and origin of the landscape features of the earth, and their underlying rocks and structures, including the work of rivers, waves and currents, wind, and glaciers; and the role of earthquakes, volcanoes, and the processes of mountain-building. 2 class hours, 1 3-hour laboratory period, and field trips. *Credit, 3. Staff.*

102 (I) (II). HISTORICAL GEOLOGY (E).
Origin and age of the earth; interpretation of the geologic time scale; development of continents and oceanic basins and their relief features; evolution of life. Prerequisite, Geology 101. 2 class hours, 1 3-hour laboratory period and field trip. *Credit, 3. Staff.*

103 (I), 104 (II). PRINCIPLES OF GEOLOGY (E).
Dynamic and regional topics selected to illustrate processes that modify the earth's crust, and the use of generalizations derived from this study in the interpretation of earth history. 2 class hours, 1 2-hour laboratory, 1 quiz-conference hour, and field trips. *Credit, 3. Staff.*

219 (I). MINERALOGY (E).
Chemical composition, physical properties, crystal form, occurrence, and identification of common minerals. Prerequisites, Chemistry 111 and 112. 2 class hours, 2 2-hour laboratory periods. *Credit, 4. Mr. Nelson.*

220 (II). INTRODUCTORY PETROLOGY.
Study of rocks with emphasis on constituent minerals, textural and structural features, classification, mode of occurrence, and origin. The laboratory work will include an introduction to petrographic methods. The course is a sequel to Geology 219 as the second half of a one year study of minerals and rocks. Prerequisites, Geology 101, 219. 2 class hours, 2 2-hour laboratory periods, and field trips by arrangement. *Credit, 4. Mr. Jaffe.*

230 (I). FIELD AND STRUCTURAL GEOLOGY I.
Basic methods of field geology; occurrences and recognition of geologic structure; preparation and interpretation of geologic maps; solution of simple structural problems. Prerequisites, Geology 101; Trigonometry. 1 class hour, 1 5-hour laboratory period, Saturday field trips. *Credit, 3. Mr. McGill, Mr. Hall.*

231 (II). FIELD AND STRUCTURAL GEOLOGY II.

Structural and dynamic analysis of deformed rocks; introduction to tectonics; field study of complex areas. Prerequisites, Geology 102, 220, 230. 1 class hour, 1 5-hour laboratory period, Saturday field trips. *Credit, 3. Mr. Robinson.*

240 (I). INVERTEBRATE PALEONTOLOGY.

The history, development, and identification of invertebrate animal fossils. Field trips by arrangement. Prerequisites, Geology 102; Zooloy 101. 1 class hour, 2 2-hour laboratory periods.

Credit, 3. Mr. Pitrat.

250 (II). SEDIMENTOLOGY AND STRATIGRAPHY.

The composition, origin and classification of sedimentary rocks, and the principles of stratigraphic correlation, with problems and examples from major rock units. Prerequisites, Geology 102, 220, 230. 2 class hours, 2 2-hour laboratory periods and field trips.

Credit, 4. Mr. Hayes, Mr. Webb.

280 (II). ENGINEERING GEOLOGY.

Not open to geology majors. Materials and surface features of the earth with emphasis on engineering problems; map reading as related to the phenomena of physical geology. 2 class hours, 1 3-hour laboratory period or field trip.

Credit, 3. Mr. Farquhar.

311 (I). OPTICAL MINERALOGY.

Principles of optics, optical properties of minerals, and methods for their measurement; relationship between optical properties and crystallography, and mineral identification by the immersion method. Prerequisites, Geology 219, Physics 103 and 104.

Credit, 3. Mr. Farquhar.

321 (II). PETROGRAPHY.

Study of minerals and common igneous, sedimentary, and metamorphic rocks in thin section; petrographic calculations and measurements; introduction to petrogenetic theory. Field examination of selected igneous and metamorphic rocks. Prerequisites, Geology, 220, 311.

Credit, 3. Mr. Robinson.

355 (I). PHYSICAL OCEANOGRAPHY.

Physical properties of sea water and their variations; water masses and their circulation patterns; interaction between ocean and atmosphere; dynamics of waves, tides, and ocean currents; techniques of oceanographic study. Prerequisites, Physics 103 and 104 or 105, 106, and 107. 3 class hours, field trips by arrangement.

Credit, 3. Mr. Hayes.

360 (I). GEOMORPHOLOGY.

Origin and development of landforms in relation to geological processes, climatic environment, and tectonic history. Application of geomorphic methods to interpretation of Cenozoic geological history. Prerequisites, Geology 101, 102, 230. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Mr. Hartshorn.

366 (II). PLEISTOCENE GEOLOGY.

Geochronology of Pleistocene time as related to climatic changes and their influence on glaciology, landforms, sedimentary deposits, sea level, and the paleontological record. Prerequisite, Geology 102, or permission of instructor. Course 360 recommended. 2 class hours, field trips by arrangement.

Credit, 3. Mr. Hartshorn.

368 (II). PHOTOGEOLOGY.

A laboratory study of the instruments and methods employed in making measurements and preparing base maps and geologic maps from vertical and oblique aerial photos. Prerequisite, Geology 230. 2 2-hour periods.

Credit, 3. Mr. Smith.

370 (I). GEOPHYSICS.

The physics of the earth and the gravitational, magnetic, electrical, and seismic methods of geophysical exploration. Laboratory work is concerned with application of geophysical methods to the solution of geologic problems, and involves methods of analysis, computation, and field surveys. Prerequisites, Geology 220, 230, 231; Mathematics 123 or 135; Physics 103 and 104 or 105, 106, and 107.

Credit, 3. Mr. Bromery.

388 (I) (II). SPECIAL PROBLEMS.

For seniors specializing in geology. Total credit may not exceed 6. Prerequisite, 21 hours of geology, or permission of department.

Credit, 1-6. Staff.

389 (I) (II). FIELD PROBLEMS.

Directed field study and/or research. Prerequisites, Geology 220, 230.

Credit, 2-6. Staff.

390 (I) (II). SEMINAR.

Review of current literature or discussion of selected topics.

Credit, 1.

GEOGRAPHY

135 (I) (II). FUNDAMENTALS OF GEOGRAPHY (E).

A systematic introduction to the study of physiography, climate, mineral resources, and man's use of his natural environment. 2 class hours, 1 2-hour laboratory period, and field trips.

Credit, 3. Staff.

200 (II). GEOGRAPHY OF ANGLO AMERICA (D).

A regional approach to the study of the physical geography of the continent and its development by man. 3 class hours.

Credit, 3. Mr. Nostrand.

205 (I). HISTORICAL GEOGRAPHY OF THE U.S. (D).

The development historically of basic physical, biotic and cultural processes which have shaped successive demographic and cultural patterns in America's changing geography. 3 class hours.

Credit, 3. Mr. Nostrand.

220 (I). LATIN AMERICA (D).

A survey of the spatial organization of cultural and physical regions of Latin America. Special emphasis on the dynamic change processes affecting man's horizontal linkages and use of the environment. 3 class hours.

Credit, 3. Mr. Wilkie.

260 (I). ECONOMIC GEOGRAPHY (D).

The distribution, production and utilization of the natural resources and commodities on which man's livelihood depends and the problems which they pose. 3 class hours.

Credit, 3. Mr. Burke.

280 (II). POLITICAL GEOGRAPHY (D).

The human and physical environments in which states exist and the problems which these environments pose in their current and likely future behavior. 3 class hours.

Credit, 3. Mr. Burke.

Germanic Languages and Literatures

Head of Department: Professor Wolfgang Paulsen. Professors Ellert, Reed, Ryan, Wittkowski; Associate Professors Born, Denkler, Lea, Reh, Schiffer; Assistant Professors Bauschinger, Beekman, Cathey, Haupt, Jacoby, E. Menz, Peter, Seelig, Waldeck; Instructors Ehrlich, Gordon, Hermann, K. Menz.

GERMAN

110, 120. ELEMENTARY GERMAN.

Conversation, reading, grammar and composition. 3 class hours, 1 laboratory hour. *Credit, 3.*

112, 122. HONORS SECTION OF ELEMENTARY GERMAN.

130, 140. INTERMEDIATE GERMAN (140: C).

Reading, conversation, composition. Grammar review. Prerequisite, German 120. 3 class hours. *Credit, 3.*

132, 142. HONORS SECTION OF INTERMEDIATE GERMAN.

136 (II). ACCELERATED GERMAN.

Intensive and accelerated course in oral communication, reading, grammar, composition. For students selected on the basis of superior achievement in German 110. Covers the equivalent of German 120 and 130. Students completing this course may qualify for German 142. 6 class hours. *Credit, 6.*

251. THE GERMAN NOVELLA.

The novella form and its development, centering on representative works of major writers in the 19th century (e.g., C.F. Meyer, Keller, Storm). Prerequisite, German 140 or equivalent. Open to freshmen who have fulfilled the language proficiency requirement. 3 class hours. *Credit, 3.*

252. THE DRAMA OF THE 19TH CENTURY.

Plays by Kleist, Grillparzer, Buchner, Hebbel. Prerequisite, junior standing and German 251 or 279; or by special permission. 3 class hours. *Credit, 3.*

253. TWENTIETH CENTURY I.

Main literary trends at the turn of the century. Particular emphasis on Naturalism, Young Vienna, the poetry of George, Hofmannsthal, and Rilke, the prose of Thomas Mann, and the plays of Hauptmann. Prerequisite, junior standing and German 251 or 279; or by special permission. 3 class hours. *Credit, 3.*

254. TWENTIETH CENTURY II.

Main literary trends beginning with Expressionism. Particular emphasis on Expressionism, Kafka, Brecht and contemporary authors. Prerequisite, junior standing and German 251 or 279; or by special permission. 3 class hours. *Credit, 3.*

255. STORM AND STRESS.

Eighteenth century Titanism in German literature centering in the early Goethe. Prerequisite, junior standing and German 251 or 279; or by special permission. 3 class hours. *Credit, 3.*

256. ROMANTICISM.

Poetry and prose of the Romantic period from Novalis to Mörike. Prerequisite, junior standing and German 251 or 279; or by special permission. 3 class hours. *Credit, 3.*

257. GOETHE'S "FAUST."

Prerequisite, junior standing and German 251 or 279; or by special permission. 3 class hours. *Credit, 3.*

258. KLOPSTOCK, WIELAND, LESSING.

The major preclassical figures and works in the poetry, novel, and drama of the eighteenth century, with special emphasis on Lessing. Prerequisite, junior standing and German 251 or 279; or by special permission. 3 class hours. *Credit, 3.*

259. HISTORY OF THE GERMAN LANGUAGE.

An introduction to the history of German, extending from its origins to modern German. Prerequisite: junior standing and German 251 or 279; or by special permission. 3 class hours. *Credit, 3.*

260. THE CLASSICAL GOETHE.

Egmont, Iphigenie, Tasso; poetry; selections from Goethe's novels and essays. Prerequisite, junior standing and German 251 or 279; or by special permission. 3 class hours. *Credit, 3.*

261. SCHILLER.

Representative plays of the early and of the classical phase; selected poetry and essays. Prerequisite, junior standing and German 251 or 279; or by special permission. 3 class hours. *Credit, 3.*

263. THE GERMAN POEM.

An historical survey based on a close reading of selected poems from the major phases of German poetry. Prerequisite, junior standing and German 251 or 279; or by special permission. 3 class hours. *Credit, 3.*

267. GERMAN MASTERPIECES IN TRANSLATION I: CLASSICISM AND ROMANTICISM.

An introduction for the non-German major to the masterpieces of the "Golden Age" in German literature: Lessing, Goethe, Schiller, and the Romantics to Heine. Not open for major credit in German. 3 class hours. *Credit, 3.*

268. GERMAN MASTERPIECES IN TRANSLATION II: MODERN GERMAN LITERATURE (C).

An introduction for the non-German major to the masterpieces of modern German literature. Not open for major credit in German. 3 class hours. *Credit, 3.*

270 (II). GERMAN CIVILIZATION.

Study and discussion of literary texts pertaining to German cultural, social and political life. Conducted in German. Prerequisite, German 140 or equivalent. 3 class hours. *Credit, 3.*

277 (I). SURVEY OF GERMAN LITERATURE I.

German literature from the Middle Ages to the Age of Enlightenment. Prerequisite, junior standing and German 251 or 279; or by special permission. 3 class hours. *Credit, 3.*

278 (II). SURVEY OF GERMAN LITERATURE II.
German literature from 1770 to the present. Prerequisite, junior standing and German 251 or 279; or by special permission. Not open for major credit in German. 3 class hours. *Credit, 3.*

279, 280. ADVANCED GERMAN.
Instruction in advanced grammar, extension of vocabulary, regular exercises in translation into German, regular exercises in free composition, and conversation. Prerequisite, German 140 or equivalent; or permission of instructor. 3 class hours, 1 drill hour. *Credit, 3.*

281. ADVANCED COMPOSITION AND TRANSLATION.
Continuation of 279 and 280, with emphasis on the writing of German (translation into German and free composition). Prerequisite, German 280 or equivalent. 3 class hours. *Credit, 3.*

385 (I), 386 (II). SPECIAL PROBLEMS.
Guided reading and research in areas of specialization. *Credit, 1, 2 or 3.*

DANISH

110, 120. ELEMENTARY DANISH.
Conversation, reading, grammar and composition. 3 class hours. 1 laboratory hour. *Credit, 3.*

126 (I). ACCELERATED ELEMENTARY DANISH.
Covers the material of Danish 110 and 120. 6 class hours, 1 laboratory hour. *Credit, 6.*

130, 140. INTERMEDIATE DANISH (140: C).
Reading, conversation, composition. Grammar review. Prerequisite, Danish 120 or 126. 3 class hours. *Credit, 3.*

146 (II). ACCELERATED INTERMEDIATE DANISH (C).
Covers the material of Danish 130 and 140. Prerequisite, Danish 120 or 126. 6 class hours. *Credit, 6.*

251. DANO-NORWEGIAN LITERATURE.
Masterpieces of Danish and Norwegian literature, with emphasis on Ibsen, Holberg, and some attention to the modern authors. Prerequisite, Danish 140 or 146 or equivalent. 3 class hours. *Credit, 3.*

DUTCH

110, 120. ELEMENTARY DUTCH.
Conversation, reading, grammar and composition. 3 class hours. 1 laboratory hour. *Credit, 3.*

126 (I). ACCELERATED ELEMENTARY DUTCH.
Covers the material of Dutch 110 and 120. 6 class hours, 1 laboratory hour. *Credit, 6.*

130, 140. INTERMEDIATE DUTCH (140: C).
Reading, conversation, composition. Grammar review. Prerequisite, Dutch 120 or 126. 3 class hours. *Credit, 3.*

146 (II). ACCELERATED INTERMEDIATE DUTCH (C).
Covers the material of Dutch 130 and 140. Prerequisite, Dutch 120 or 126. 6 class hours. *Credit, 6.*

251. DUTCH AND FLEMISH LITERATURE.
Masterpieces of Dutch and Flemish (Belgian) literature. Prerequisite, Dutch 140 or 146 or equivalent. 3 class hours. *Credit, 3.*

268. MODERN DUTCH FICTION IN TRANSLATION.
Masterpieces of modern and contemporary Dutch fiction in English translation. An introduction to a little-known literary territory. No knowledge of Dutch is required. 3 class hours. *Credit, 3.*

SWEDISH

110, 120. ELEMENTARY SWEDISH.
Conversation, reading, grammar and composition. 3 class hours, 1 laboratory hour. *Credit, 3.*

126 (I). ACCELERATED ELEMENTARY SWEDISH.
Covers the material of Swedish 110 and 120. 6 class hours, 1 laboratory hour. *Credit, 6.*

130, 140. INTERMEDIATE SWEDISH (140: C).
Reading, conversation, composition. Grammar review. Prerequisite, Swedish 120 or 126. 3 class hours. *Credit, 3.*

146 (II). ACCELERATED INTERMEDIATE SWEDISH (C).
Covers the material of Swedish 130 and 140. Prerequisite, Swedish 120 or 126. 6 class hours. *Credit, 6.*

Government

Head of Department: Professor William C. Havard. Professors Beth, Braunthal, Fenton, Fliess, Harris, Houn, Howards, Lederle, Lewy, Maki, Oppenheim, Vali; Associate Professors Allen, Booth, Feit, Gere, Gordon, King, Mainzer, Syed, Wiarda; Assistant Professors Alfange, Connolly, Coulter, Friedman, Goldman, Gugin, Hinckley, Kramer, Ryavec, Shanley, Steeper, Sulzner; Instructor Mileur.

100 (I) (II). AMERICAN GOVERNMENT (D).
Political institutions and processes, as illustrated by the American governmental system. 3 class hours. *Credit, 3. Staff.*

150 (I) (II). EUROPEAN GOVERNMENTS (D).
A survey of the politics and governmental institutions of Great Britain, France, Germany and Soviet Russia. 3 class hours. *Credit, 3. Staff.*

160 (I) (II). INTRODUCTION TO POLITICS (D).
Theories, forms, and functions of modern government as illustrated in the political systems of the United States, Great Britain, Soviet Russia, and other states. 3 class hours. *Credit, 3. Staff.*

161 (I) (II). ISSUES OF WORLD POLITICS (D).
The nature and role of parties in the modern state. Comparative political processes of executives, legislatures, and judiciaries in the United States, Great Britain, Soviet Russia, and other states. The challenge of international politics to modern governments. 3 class hours. *Credit, 3. Staff.*

201 (I). ANCIENT & MEDIEVAL POLITICAL THOUGHT (D).
The development of political thought and its relation to cultural and institutional growth from the time of the Greeks to the end of the Middle Ages. 3 class hours.

Credit, 3. Messrs. Connolly, Havard, King, Lewy, Oppenheim.

202 (II). MODERN POLITICAL THOUGHT (D).

The development of political thought and its relation to cultural and institutional growth from the rise of the modern state to the present. 3 class hours.

Credit, 3. Messrs. Connolly, Havard, King, Lewy, Oppenheim.

203 (II). PROBLEMS IN POLITICAL THOUGHT.

An analysis of central concepts and themes in political theory. Attention to major orientations in both classical and contemporary thought. 3 class hours.

Credit, 3. Messrs. Connolly, Havard, King, Oppenheim.

218 (I) (II). POLITICAL PARTIES AND ELECTIONS (D).

The American political process, with emphasis on parties, pressure groups, and public opinion. 3 class hours.

Credit, 3. Messrs. Coulter, Fenton, Gordon, Shanley, Sulzner, Mrs. Hincley.

219 (II). STATE GOVERNMENT (D).

American state politics, organization, and functions, with emphasis on the role of the state in our Federal system. Prerequisite, Government 100 or 160-161, or consent of instructor. 3 class hours.

Credit, 3. Messrs. Booth, Howards, Shanley.

220 (I). MUNICIPAL GOVERNMENT (D).

A survey of the governmental structure and function of American municipalities. 3 class hours.

Credit, 3. Messrs. Booth, Coulter, Gere, Grady, Howards.

221 (II). THE PRACTICE OF AMERICAN POLITICS.

A course in practical American politics, given by a prominent political leader under the University Distinguished Professorship in Public Affairs. Prerequisite, Government 100 or 160-161. 2 class hours.

Credit, 2.

226 (I) (II). GOVERNMENT AND POLITICS OF RUSSIA (D).

Organization and functioning of the Communist party; the administrative process; terror as a system of power; Soviet foreign policy, its formation and execution. Prerequisite, Government 150 or 160-161 or History 100-101 or permission of instructor. 3 class hours.

Credit, 3. Mr. Fliess, Mr. Ryavec, Mr. Vali.

237 (I) (II). GOVERNMENT AND POLITICS OF CHINA AND JAPAN (D).

An analysis of the political ideologies, party movements, governmental institutions, and major domestic and foreign policies of contemporary China and Japan. Prerequisite, Government 150 or 160-161 or permission of instructor. 3 class hours.

Credit, 3. Mr. Houn.

238 (I) (II). GOVERNMENT AND POLITICS OF SOUTH AND SOUTHEAST ASIA (D).

A comparative study of the institutions and dynamics of government and politics in South and Southeast Asia, especially in

India, Pakistan, Indonesia, and Malaysia with particular reference to issues of political stability, economic development, and relations with the United States and other great powers. Prerequisite, Government 150 or 160-161 or permission of instructor. 3 class hours.

Credit, 3. Messrs. Allen, Syed.

240 (I). GOVERNMENT AND POLITICS OF SOUTH AMERICA (D).

A comparative analysis of the interest groups, political parties, and governmental institutions of the South American countries with special emphasis on the background and political culture in which Latin American politics and government take place. Prerequisites, Government 150, or previous courses in Latin America, or permission of instructor. 3 class hours.

Credit, 3. Mr. Wiarda.

241 (II). GOVERNMENT AND POLITICS OF CENTRAL AMERICA AND THE CARIBBEAN (D).

A comparative analysis of the interest groups, political parties, and governmental institutions of the Central American and Caribbean countries with special emphasis on communism and the role of the U.S. Prerequisites, Government 150, or previous courses in Latin America, or permission of instructor. 3 class hours.

Credit, 3. Mr. Wiarda.

242 (I). THE POLITICS OF SUB-SAHARAN AFRICA (D).

The organization and processes of African politics, centering on the general political problems facing contemporary African governments. Prerequisite, permission of instructor. 3 class hours.

Credit, 3. Messrs. Feit, Steeper.

243 (II). COMPARATIVE AFRICAN GOVERNMENTS (D).

A comparative study of the political process in five African states. Prerequisites, Government 242, or permission of the instructor. 3 class hours.

Credit, 3. Messrs. Feit, Steeper.

244. POLITICAL DEVELOPMENT AND MODERNIZATION (D).
A comparative analysis of political change and development in the emerging nations. 3 class hours.

Credit, 3. Mr. Wiarda.

248 (I) (II). GREAT BRITAIN AND THE COMMONWEALTH (D).

The practice of parliamentary government in Great Britain and the Commonwealth countries, with emphasis on the development of the conception of the Commonwealth, the institutions through which the Commonwealth operates, and its role in contemporary world politics. Prerequisite, Government 150 or 160-161 or permission of instructor. 3 class hours.

Credit, 3. Mr. Harris.

254 (I) (II). INTERNATIONAL RELATIONS (D).

The nation-state system and conceptions of national interest in modern world politics. Forms and distribution of power. Making of foreign policy and adjusting international conflict. Prerequisite, Government 150 or 160-161, or History 101, or permission of instructor. 3 class hours.

Credit, 3. Messrs. Allen, Braunthal, Fliess, Steeper, Vali.

272 (I) (II). PUBLIC ADMINISTRATION (D).

The organization of bureaucracy; the bureaucratic life; the constitutional position and political role of governmental bureaucracy. Prerequisite, Government 100 or 160-161, or permission of instructor. 3 class hours.

Credit, 3. Messrs. Harris, Kramer, Mainzer.

273 (II). PUBLIC PERSONNEL ADMINISTRATION.

The personnel function in bureaucracy; patronage and merit; career service and political executive; authority and informal organization; employee rights and collective action. Prerequisite, Government 100 or 160-161, or permission of instructor. 3 class hours. *Credit, 3. Messrs. Kramer, Mainzer.*

275 (I). COMPARATIVE PUBLIC POLICY.

A comparative analysis of policy formation: the process of social and economic policy decision-making in selected industrial societies; the interaction of institutions, ideas, and power in decisions concerning social welfare, economic planning, and related policy areas. Prerequisite, permission of instructor. 3 class hours. *Credit, 3.*

276 (II). POLITICAL THEORY, IDEOLOGY, AND PUBLIC POLICY.

The evaluation of social policy: a consideration of some of the normative issues raised in controversies over selected cases of social and economic policy in the light of the main traditions of Western political thought and of recent work on the logical and ethical aspects of social choice. Prerequisite, permission of instructor. 3 class hours. *Credit, 3.*

277. ARMED FORCES AND POLITICAL POLICY.

A comparative study of civilian-military relations in the Western and non-Western nations, concentrating both on regular and irregular armed forces. *Credit, 3. Mr. Feit.*

290 (I) (II). CONSTITUTIONAL LAW (D).

An historical study of the United States Constitution as interpreted by decisions of the Supreme Court. Prerequisite, Government 100 or 160-161, or permission of instructor. 3 class hours. *Credit, 3. Messrs. Alfange, Beth, Goldman.*

291 (I) (II). THE LAW AND PRACTICE OF CIVIL LIBERTIES (D).

Development in American Constitutional Law of the concept of civil liberty, including free speech and religion, fair trial, and race discrimination. Prerequisite, Government 100 or 160-161, or permission of instructor. 3 class hours. *Credit, 3. Messrs. Alfange, Beth, Goldman, Lewy.*

292 (I) (II). POLITICS, THE LAW AND JUDICIAL BEHAVIOR (D).

Law as the political and social means of adjusting needs and desires to governmental policy. Judicial behavior in lawmaking and law enforcing. Prerequisite, Government 100 or 160-161, or permission of instructor. 3 class hours. *Credit, 3. Messrs. Alfange, Beth, Goldman.*

303 (II). AMERICAN POLITICAL THOUGHT (D).

The development of American political thought from colonial times to the present. 3 class hours. *Credit, 3. Messrs. Gere, Havard, Syed.*

306 (II). COMMUNIST POLITICAL THOUGHT.

A study of the philosophical and religious origins of communism in western and eastern Europe; an analysis of the classics from Marx to Khrushchev with emphasis on causes, nature, and effect of communism as the ideology of a national and international movement; community theory of state, law, and democracy, and socialist ethics. 3 class hours. *Credit, 3. Mr. Fliess.*

321 (II). THE PRESIDENCY IN AMERICAN GOVERNMENT (D). Constitutional and political aspects of the presidency in legislation, administration and conduct of foreign and military affairs. The President as party leader. Prerequisite, Government 100 or 160-161, or permission of instructor. 3 class hours.

322 (II). THE LEGISLATIVE PROCESS (D).

The functions of national and state legislative procedures, and the role played by political parties and pressure groups in the legislative process. Prerequisite, Government 218, or permission of instructor. 3 class hours. *Credit, 3. Messrs. Gordon, Sulzner, Mrs. Hinckley.*

323 (II). PUBLIC OPINION IN POLITICS (D).

Opinion and communication as aspects of the political process, with emphasis upon communication through mass media. 3 class hours. *Credit, 3. Mr. Fenton, Mrs. Hinckley.*

324 (I) (II). METROPOLITAN POLITICS (D).

Problems of metropolitan areas; actual and possible political approaches to their solution. The role of parties, development of political leadership, existing political institutions, pressure group activity, etc. Prerequisite, Government 218, or permission of instructor. 3 class hours. *Credit, 3. Messrs. Booth, Coulter, Howards.*

355 (II). AMERICAN FOREIGN POLICY (D).

The principles of American foreign policy. Constitutional, political and administrative considerations which influence the formation and execution of foreign policy. Prerequisite, Government 100 or 160-161, or permission of instructor. 3 class hours. *Credit, 3. Messrs. Allen, Braunthal, Steeper.*

356. INTERNATIONAL LAW (D).

The origin, character, and function of international law. Prerequisite, Government 254 or History 211, or permission of instructor. 3 class hours. *Credit, 3. Messrs. Allen, Fliess, Vali.*

357. (II). INTERNATIONAL ORGANIZATION (D).

International organization in the twentieth century, with emphasis upon the United Nations and regional organizations. Prerequisite, Government 254 or History 211, or permission of instructor. 3 class hours. *Credit, 3. Messrs. Allen, Fliess, Vali.*

358. (I). INTERNATIONAL RELATIONS: ASIA (D).

Introduction to general problems of Asian international relations since 1859 plus detailed examination of problems since World War I. Emphasis on China, Japan and new nations. Prerequisite, Government 150 or 160-161, or History 101, or permission of instructor. 3 class hours. *Credit, 3. Mr. Houn.*

360 (III). SOVIET FOREIGN POLICY.

An analysis of continuity and change in Soviet perceptions, goals, methods, and priorities in foreign policy with emphasis upon the period since World War II. 3 class hours. *Credit, 3. Mr. Ryavec.*

374 (II). ADMINISTRATIVE LAW (D).

Governmental activities in the regulation of industry, agriculture, and labor with emphasis on the legal framework within which these activities operate. 3 class hours. *Credit, 3. Staff.*

391 (I), 392 (II). SEMINAR.
Special problems in the field of government. 3 class hours.
Credit, 3. Staff.

393 (I). SENIOR HONORS SEMINAR.
A seminar for senior honor students on the study of politics. Prerequisite, consent of the Departmental Honors Committee and concurrent enrollment in Government 399. 3 class hours.
Credit, 3. Staff.

RELATED COURSES:

HISTORY 340 (I). Civilization of Islam.
HISTORY 341 (II). The Modern Middle East.

History

Acting Head of Department: Professor Archibald R. Lewis. Professors Albertson, Caldwell, Gordon, Greenbaum, Hanke, Ilardi, Kirk, McNeal, Potash, Quint; Associate Professors Bernhard, Cantor, Chrisman, Davis, DePillis, Gruman, Hart, Hernon, Ware, F. Wickwire; Assistant Professors Berkman, Boyer, Drake, Johnston, Jones, Levy, McFarland, Nissenbaum, Oates, Rearick, Richards, Sarti, Shipley, Tager, Thompson, VanSteenberg, Wyman; Instructors Bittel, Danahar; Visiting Lecturers Loy, M. Wickwire.

History majors must take as required courses in their freshman and sophomore years two year-long sequences chosen from History 100–101, 110–111, 115–116, 120–121, or 150–151. In addition they are required to take History 190, preferably in the sophomore year. The history major will select one of four areas of specialization (European, British, American or Latin American history) and take within it a minimum of 15 or a maximum of 18 credits of upper-level course work. Students specializing in European history will be required to include in their program at least 3 credits in ancient or medieval history and an additional 3 credits in the early modern period (from the Renaissance through the 18th century).

100 (I) (II), 101 (I) (II). HISTORY OF WESTERN THOUGHT AND INSTITUTIONS (C).
The historical development of the western European countries, their ideas, and institutions. Either semester may be elected independently. Admission to honors sections of these courses (102, 103) is by permission of the department. 3 class hours.
Credit, 3.

102 (I) (II), 103 (I) (II). HONORS SECTION OF HISTORY OF WESTERN THOUGHT AND INSTITUTIONS (C).

106 (I), 107 (II). HONORS SEMINAR IN MODERN EUROPEAN HISTORY.
A thematic approach to the history of Europe since about 1715. Open to Commonwealth scholars and selected students. 3 class hours.
Credit, 3.

110 (I), 111 (II). PROBLEMS IN WORLD CIVILIZATION (C).
A comparative study of both the common and distinctive aspects of the world's great civilization at critical phases of their development. Either semester may be elected independently. 3 class hours.
Credit, 3.

115 (I), 116 (II). HISTORY OF EAST ASIAN CIVILIZATION (C).
An introductory survey of China, Japan, Korea and related regions. The first semester will stress the setting and style of the traditional societies to the nineteenth century; the second semester will treat the development of the area to the present time. Either semester may be elected independently. 3 class hours.
Credit, 3. Staff.

120 (I), 121 (II). HISTORY OF LATIN AMERICAN CIVILIZATION (C).
An introduction to the history of Latin America. The first semester will treat the period from pre-conquest times to the close of the colonial era; the second will deal with the evolution of Latin America in the nineteenth and twentieth centuries. Either semester may be elected independently. 3 class hours.
Credit, 3. Staff.

150 (I), 151 (II). THE DEVELOPMENT OF AMERICAN CIVILIZATION (C).
A survey of the American national growth. Either semester may be elected independently. Admission to honors sections of these courses (152, 153) is by permission of the department. 3 class hours.
Credit, 3.

152 (I), 153 (II). HONORS SECTIONS OF THE DEVELOPMENT OF AMERICAN CIVILIZATION (C).
185 (I), 186 (II). EXPERIMENTAL COURSE (C).
New problems, techniques, and approaches in the study of history. 3 class hours.
Credit, 3. Staff.

190 (I), (II). HISTORIOGRAPHY AND BIBLIOGRAPHY (C).
Training in the techniques of historical inquiry, the location, appraisal, and handling of source materials. 3 class hours.
Credit, 3.

200 (I). THE ANCIENT WORLD TO GRAECO-PERSIAN WAR (C).
From origins of human society to the Greek confrontation with the Persian Empire. 3 class hours.
Credit, 3. Mr. Kirk.

201 (II). THE ANCIENT WORLD: PERICLES TO CONSTANTINE (C).
The successive assertions and breakdowns of leadership in the Greek and Roman Worlds. 3 class hours.
Credit, 3. Mr. Kirk.

202 (II). EARLY MIDDLE AGES, 300–1100 (C).
Spread of Christianity; pagan and early Christian culture; Germanic kingship; the Carolingian world; early feudalism; monasticism and ecclesiastical centralization. 3 class hours.
Credit, 3. Mr. Ware.

203 (I). THE LATTER MIDDLE AGES, 1100–1350 (C).
Revival of towns and commerce; the growth and development of the feudal monarchies and ecclesiastical authority; rise of secularism. 3 class hours.
Credit, 3. Mr. Ware.

205 (I), 206 (II). THE AGE OF THE RENAISSANCE AND REFORMATION, 1300-1600 (C).

The changes in European thought and institutions during the development of Humanism and the Protestant and Catholic Reformations. Either semester may be elected independently. 3 class hours. *Credit, 3. Mr. Ilardi.*

207 (I). EUROPE IN THE ENLIGHTENMENT, 1685-1789 (C).

Civilization of western Europe in the eighteenth century, its social milieu, intellectual setting, institutional forces, religious tendencies, aesthetic contributions, and the growth of the revolutionary spirit. 3 class hours. *Credit 3. Mr. Greenbaum.*

208 (II). THE FRENCH REVOLUTION AND NAPOLEON (C).

Political change in Europe from the Old Regime and the French Revolution to the fall of Napoleon. 3 class hours. *Credit, 3.*

209 (II). HISTORY OF EUROPE, 1815-1870 (C).

Major developments in the internal and international affairs of the European states from the Congress of Vienna to the Franco-Prussian War. 3 class hours. *Credit, 3. Mr. Rearick.*

210 (I). EUROPE, 1870-1918 (C).

Internal developments of the principal countries; a detailed study of conditions and diplomacy which led to the World War; military and diplomatic history of the war years. 3 class hours. *Credit, 3. Mr. VanSteenberg.*

211 (II). EUROPE SINCE 1918 (C).

Major developments in the internal and international affairs of the European states since World War I. 3 class hours. *Credit, 3. Mr. VanSteenberg.*

212 (I). EUROPEAN INTELLECTUAL HISTORY IN THE NINETEENTH CENTURY (C).

Chief intellectual currents in Europe; romanticism, liberalism, religious revival, socialism, Darwinism, racism, and mass culture. 3 class hours. *Credit, 3. Mr. Gruman, Mr. Johnston.*

213 (II). EUROPEAN INTELLECTUAL HISTORY IN THE TWENTIETH CENTURY (C).

Philosophical, academic, literary, aesthetic, political and popular currents since 1900. Admission by permission of instructor. 3 class hours. *Credit, 3. Mr. Gruman, Mr. Johnston.*

214 (I), 215 (II). THE HISTORY OF RUSSIA (C).

Political, economic, social and intellectual development of Russia. First semester: Tsarist era; second: origins of Russian Marxism and the Soviet period. Either semester may be elected independently. 3 class hours. *Credit, 3. Mr. Jones.*

216 (I). THE RUSSIAN REVOLUTION (C).

An intensive study of the origins, course, and impact of the Bolshevik revolution. 3 class hours. *Credit, 3. Mr. McNeal.*

217 (II). SOVIET RUSSIA (C).

Major social, political, intellectual developments, and the international relations of Soviet Russia since the Bolshevik Revolution. 3 class hours. *Credit, 3. Mr. McNeal.*

218 (I). EARLY MODERN GERMANY (C).

From the end of the Thirty Years' War to the collapse of the Napoleonic hegemony. 3 class hours. *Credit, 3. Mr. Gordon.*

219 (II). THE HISTORY OF MODERN GERMANY (C).

The evolution and development of Germany since The Congress of Vienna, with emphasis upon diplomatic, political, military and social-economic trends and problems. 3 class hours. *Credit, 3. Mr. Gordon.*

220 (I). MODERN SCANDINAVIA (C).

The major issues of domestic and foreign politics of the states of northern Europe in the Nineteenth and Twentieth Centuries. 3 class hours. *Credit, 3. Mr. VanSteenberg.*

221 (I). FRANCE SINCE 1789 (C).

Selected, formative political crises from 1789 to the present, and their settings in the economic, social, and intellectual life of modern France. 3 class hours. *Credit, 3.*

223 (II). HISTORY OF SPAIN (C).

Emergence of the Spanish kingdom; the era of empire; Bourbon Spain; the Republic and its aftermath. 3 class hours. *Credit, 3.*

227 (I). MILITARY HISTORY OF MODERN EUROPE (C).

Development of European military theory and practice from the Napoleonic era to the present. 3 class hours. *Credit, 3. Mr. Gordon.*

228 (II). EUROPE IN THE AGE OF THE BAROQUE (C).

Europe from the Wars of the Counter-Reformation to the Glorious Revolution. Civilization of the Baroque in its social, political, economic, religious and intellectual settings. 3 class hours. *Credit, 3. Mr. Greenbaum.*

229 (II). SOCIAL HISTORY OF EARLY MODERN EUROPE (C).

The social institutions of Europe as they change from a system of feudal organization to pre-industrial society, including the evolution of the town to the city, the changing role of the church, the changing role of agrarian life, the development of an intellectual class. 3 class hours. *Credit, 3. Mrs. Chrisman.*

230 (II). HISTORY OF MODERN ITALY (C).

Survey of modern Italy from the origins of the *Risorgimento* in the eighteenth century to the "opening to the left" of the 1960's, with particular reference to domestic problems after the unification, to Italian foreign policy up to the Second World War, and to the rise and consolidation of fascism. 3 class hours. *Credit, 3. Mr. Sarti.*

231 (I), 232 (II). ENGLISH HISTORY (C).

Emphasis on economic, social, and cultural influences, as well as on constitutional development. Either semester may be elected independently. 3 class hours. *Credit, 3. Mr. Hernon, Mr. Shipley.*

233 (II). MEDIEVAL ENGLAND (C).

The history of England from the fifth to the fifteenth century, with particular attention to the Anglo-Saxon period, the Norman Conquest, and the evolution of government to the accession of the Tudors. 3 class hours. *Credit, 3. Mr. Ware.*

234 (I), 235 (II). TUDOR-STUART ENGLAND, 1485-1688 (C).
Selected aspects of the constitutional, social, intellectual, and imperial history of England in this period. Either semester may be elected independently. 3 class hours. *Credit, 3. Mr. Shipley.*

236 (I). BRITAIN IN THE EIGHTEENTH CENTURY (C).
Selected aspects of social, intellectual, imperial, and constitutional history, including the Acts of Union. Impact of the Industrial and French Revolutions. 3 class hours.
Credit, 3. Mr. Wickwire.

237 (I), 238 (II). MODERN BRITAIN (C).
Selected topics on the political, social, and intellectual development of Britain in the nineteenth and twentieth centuries. Either semester may be elected independently. 3 class hours.
Credit, 3. Mr. Caldwell, Mr. Hernon.

239 (II). HISTORY OF THE BRITISH EMPIRE AND COMMONWEALTH SINCE 1783 (C).
Evolution of British imperial policy; growth of the Dominions, the Commonwealth, and the dependent Empire; role of the Empire in world politics. 3 class hours. *Credit, 3. Mr. Wickwire.*

301 (II). BRAZIL AND ARGENTINA IN THE NINETEENTH AND TWENTIETH CENTURIES (C).
The emergence of the major South American states. Particular attention will be paid to political organization and economic change, and in the contemporary period to the growth of nationalism and mass-based political movements. 3 class hours.
Credit, 3. Mr. Potash.

302 (I). THE HISTORY OF MEXICO (C).
Mexico from the end of the eighteenth century to the present. Emphasis will be given to political, economic, and social developments. 3 class hours.
Credit, 3. Mr. Potash.

303 (I). THE CARIBBEAN (C).
The Caribbean as a focus of conflict and adjustment from the fifteenth century to the present. 3 class hours.
Credit, 3. Mrs. Loy.

304 (II). HISTORY OF GRAN COLOMBIA (C).
Colombia, Venezuela and Ecuador from colonial settlement to the present. 3 class hours.
Credit, 3. Mrs. Loy.

305 (II). HISTORY OF THE ANDEAN REPUBLICS (C).
Peru, Bolivia, and Chile from the late colonial period to the present. Emphasis will be on political, social and economic developments with particular attention to institutions. 3 class hours.
Credit, 3.

316 (I). AMERICAN COLONIAL HISTORY TO 1763 (C).
Discovery and exploration; early European settlements; system of political and economic control; religious and intellectual development; Anglo-French rivalry. 3 class hours.
Credit, 3. Mr. Bernhard.

317 (II). THE AMERICAN REVOLUTIONARY ERA (C).
Coming of the Revolution; War for Independence; evolution of American federalism. 3 class hours. *Credit, 3. Mr. Bernhard.*

318 (II). THE EARLY NATIONAL PERIOD, 1789-1828 (C).
The development of the United States in its formative years, emphasizing political, intellectual, and diplomatic factors. 3 class hours.
Credit, 3. Mr. Bernhard.

319 (I). JACKSONIAN AMERICA (C).
Political, economic, and social developments in the period before the Civil War. 3 class hours.
Credit, 3. Mr. Richards, Mr. Oates.

320 (I). CIVIL WAR AND RECONSTRUCTION, 1860-1877 (C).
Conduct of the war; political problems; national reunification. 3 class hours.
Credit, 3. Mr. Oates.

321 (II). THE GILDED AGE (C).
The emergence of modern political issues during the final decades of the 19th century. Emphasis on the role of industrialization, corporate consolidation, urban growth, and labor, agrarian, and genteel protest. 3 class hours.
Credit, 3. Mr. McFarland.

324 (I). THE PROGRESSIVE AGE, 1900-1920 (C).
The political response to the changing economic and social conditions in American life. 3 class hours.
Credit, 3. Mr. Thompson, Mr. McFarland, Mr. Tager.

325 (II). CONSERVATISM AND REFORM, 1920-1945 (C).
American political, economic and intellectual life between the two World Wars. 3 class hours.
Credit, 3. Mr. Thompson, Mr. Albertson, Mr. Wyman.

326 (I), 327 (II). HISTORY OF AMERICAN THOUGHT AND CULTURE (C).
The basic strands of American thought and their reflection in American culture. First semester deals with the period before 1865. Either semester may be elected independently. 3 class hours.
Credit, 3. Mr. Quint, Mr. Cantor, Mr. Boyer.

328 (I). UNITED STATES CONSTITUTIONAL HISTORY TO THE CIVIL WAR (C).
Origins and development of American constitutionalism from the 17th century to the outbreak of sectional armed conflict. 3 class hours.
Credit, 3. Mr. Cantor.

329 (II). UNITED STATES CONSTITUTIONAL HISTORY FROM THE CIVIL WAR TO THE PRESENT (C).
Evolution of constitutional power in modern America. 3 class hours.
Credit, 3. Mr. Cantor.

330 (I), 331 (II). SOCIAL HISTORY OF THE UNITED STATES (C).
The evolving status of individuals and groups and problems of migration, livelihood, urbanization, and social conflict. Either semester may be elected independently. 3 class hours.
Credit, 3. Mr. DePillis.

332 (I). THE SOUTH IN AMERICAN HISTORY (C).
From early settlement to contemporary regional problems. 3 class hours.
Credit, 3. Mr. Thompson.

333 (II). HISTORY OF AMERICAN WESTWARD EXPANSION 1763-1893 (C).

Advance of settlement from the Appalachians to the Pacific and the influence of the frontier upon social, economic, and political conditions. 3 class hours. *Credit, 3.* Mr. Davis, Mr. DePillis.

334 (I), 335 (II). DIPLOMATIC HISTORY OF THE UNITED STATES (C).

Development of American foreign relations, 1776 to the present. Either semester may be elected independently. 3 class hours. *Credit, 3.* Mr. Hart.

336 (II). HISTORY OF THE AMERICAN LABOR MOVEMENT (C).

Evolution of trade unionism in American life from late 18th century origins through post-Civil War developments to the present. Critical evaluation of changes in labor history. 3 class hours. *Credit, 3.*

337 (II). THE CITY IN THE MODERN UNITED STATES (C).

The industrial city and the full-scale urbanization of the modern United States. The effect of city life upon the social, political, and economic institutions of America, with emphasis on the historical origins of the problems of modern urban existence. 3 class hours. *Credit, 3.* Mr. Tager.

338 (II). AFRO-AMERICAN HISTORY (C).

African background of the black man, origins and progress of slavery in colonial America and the United States, development of Afro-American culture, and distinctive contributions of the black man to United States history. 3 class hours. *Credit, 3.*

339 (II). UNITED STATES SINCE PEARL HARBOR (C).

Emphasis on political, economic, and social currents since World War II. 3 class hours. *Credit, 3.* Mr. Wyman.

340 (I). CIVILIZATION OF ISLAM (C).

From the "revolutionary idea" of Islam and its conquest of an Arab empire to 18th century decay and the Western challenge. 3 class hours. *Credit, 3.* Mr. Kirk.

341 (II). THE MODERN MIDDLE EAST (C).

From the impact of 18th century Europe on the Islamic empire to the emergence of 20th century Arab nationalism and socialism and the decline of Western influence. 3 class hours. *Credit, 3.* Mr. Kirk.

342 (II). THE OTTOMAN EMPIRE (C).

Ottoman history and institutions from the origins of the state to the proclamation of the Turkish Republic, ca. 1280 to 1923. Emphasis on political, economic and social history and the problems of westernization. 3 class hours. *Credit, 3.*

370 (I), 371 (II). HISTORY OF SCIENCE (C).

Development of major scientific achievements from antiquity to the present. Emphasis on scientific theory; conceptual developments are treated in philosophical, cultural, sociological and scientific contexts. Prerequisite, one year of physical science. 3 class hours. *Credit, 3.*

385 (I), (II). SPECIAL PROBLEMS.

For individual students specializing in history. Guided reading in areas of specialization. *Credit, 1-3.* Staff.

386 (I), (II). SPECIAL TOPICS.

Special topics to be arranged, chiefly for advanced history majors. *Credit, 3.* Staff.

395 (I), (II). SENIOR SEMINAR.

For seniors specializing in history. Intensive study in area of specialization, with emphasis on research papers. 3 class hours. *Credit, 3.* Staff.

399 (I), (II). SENIOR HONORS.

LATIN AMERICAN STUDIES

Undergraduates interested in Latin America may enroll in the Latin American Studies Program. The Program does not constitute a major and is designed to supplement the work done in a regular discipline. However, those students who fulfill the requirements of the Program will be awarded the Certificate in Latin American Studies attesting to their attainment in area and language studies. To earn a certificate a student must 1) satisfactorily demonstrate a practical working knowledge of Spanish or Portuguese and elementary proficiency in the other, 2) satisfactorily complete four courses focused on Latin America, and 3) participate in the Inter-disciplinary Seminar on Latin America. The requirements of the Program are to be met partly through courses that fulfill existing requirements of the College and partly through the careful use of electives.

The Committee on Latin American Studies administers the Program and advises interested students. Members of the Committee are: R. L. Bancroft, (Spanish); M. Best (Economics); R. A. Potash, Chairman, (History); D. Proulx, (Anthropology); H. Wiarda, (Government); R. Wilkie, (Geography.)

390 (II). INTERDISCIPLINARY SEMINAR ON LATIN AMERICA.

Topics in modern and contemporary Latin America. For Certificate Program seniors and others who have completed at least three courses representing at least two different disciplines on Latin America and have a reading knowledge of either Spanish or Portuguese. 3 class hours. *Credit, 3.*

Honors Program

Chairman of Program: Professor Everett H. Emerson.

Honors Program courses are usually open only to Commonwealth Scholars in the College Honors Program.

181 (I), 182 (II), 183 (I), 184 (II). COLLEGE HONORS STUDIES IN THE HUMANITIES (C).

Studies in an area of one or more of the humanistic disciplines, such as art, literature, music, history, or philosophy. For Honors

Program freshmen and sophomores, and others by permission of the Director of Honors. 3 class hours. *Credit, 3.*

185 (I), 186 (II), 187 (I), 188 (II). COLLEGE HONORS—
STUDIES IN THE
SOCIAL SCIENCES.

Studies in an area of one or more of the social sciences, such as economics, psychology, sociology, or anthropology. For Honors freshmen and sophomores, and others by permission of the Director of Honors. 3 class hours. *Credit, 3.*

189 (I), 190 (II), 191 (I), 192 (II). COLLEGE HONORS—
STUDIES IN THE SCIENCES
AND MATHEMATICS (E).

Studies in an area of one or more of the sciences, such as physics, chemistry, botany, astronomy, geology, or zoology, or of mathematics. For Honors Program freshmen and sophomores, and others by permission. 3 class hours. *Credit, 3.*

385 (I), 386 (II). COLLEGE HONORS—INTERDISCIPLINARY
STUDIES: JUNIOR COLLOQUIUM.

An interdisciplinary seminar for Honors Program juniors, open by invitation only. 3 class hours. *Credit, 3.*

387 (I), 388 (II). COLLEGE HONORS—INTERDISCIPLINARY
STUDIES: SENIOR COLLOQUIUM.

An interdisciplinary seminar for Honors Program seniors, open by invitation only. 3 class hours. *Credit, 3.*

391 (I), 392 (II), 393 (I), 394 (II). COLLEGE HONORS—
INTERDISCIPLINARY SEMINAR.

Study through the seminary method of a problem requiring the use of several disciplines. For Honors Program juniors and seniors, and others by permission. 3 class hours. *Credit, 3.*

Journalistic Studies

Chairman: Assistant Professor B. D. Emmart. *Professor* Musgrave; *Associate Professor* Politella; *Lecturer* Oickle.

The program in Journalistic Studies offers a double major (15 credits in Journalistic Studies and the requirements of the associated department) and an interdepartmental major (15 credits in Journalistic Studies and 15 upper-class credits in the associated department). The interdepartmental major is open to upperclass students on written approval from the Journalistic Studies Division.

Majors must elect at least three of the following seven content (as distinguished from writing) courses in Journalistic Studies: 201, 202, 208, 210, 385, 386, 392.

Any two of the advanced writing courses noted below, as offered by the Department of English, are acceptable in meeting the major requirement of 15 credits in Journalistic Studies; but only one such course is to be elected per semester.

For students who wish to acquire professional guidance and experience, the program provides non-credit

tutoring and on-the-job training. All majors should consider enrolling for tutoring, which is also open to students in other departments. Faculty members with experience in hiring and training reporters will provide students with counseling and job-placement services.

201 (I) (II). INTRODUCTION TO MASS COMMUNICATION.
Topics include the communications revolution and freedom of the press, the communication process, methods of reporting and writing, communication theory and research. 3 class hours.

Credit, 3. Mr. Musgrave.

202 (I) (II). LANGUAGE AND COMMUNICATION.
Analysis of several approaches to language study, with emphasis on empirical research. 3 class hours. *Credit, 3. Mr. Emmart.*

208 (I or II as enrollment warrants). COMMUNICATIONS
THEORY.

Introduction to journalism as a social and behavioral science concerned with the way in which communications are arranged in our society. 3 class hours. *Credit, 3. Mr. Emmart.*

210 (I or II as enrollment warrants). INTERNATIONAL
COMMUNICATIONS.

Comparative study of mass media in countries other than the United States, and of the flow of communications among nations. 3 class hours. *Credit, 3. Mr. Emmart.*

331 (I) (II). TECHNICAL WRITING (Same as English 331).

334 (II). ADVANCED TECHNICAL WRITING (Same as English 334).

337 (I) (II). ADVANCED EXPOSITORY WRITING (Same as English 337).

339 (I) (II). ARTICLE WRITING (Same as English 339).

341 (I) (II). CREATIVE WRITING (Same as English 341).

345 (I or II as enrollment warrants). CREATIVE WRITING (Same as English 345).

346 (I or II as enrollment warrants). CREATIVE WRITING (Same as English 346).

347 (I or II as enrollment warrants). CREATIVE WRITING (Same as English 347).

385 (I), 386 (II). INDEPENDENT STUDY AND RESEARCH
Individual work under staff supervision for well-qualified juniors and seniors. Prerequisite: Permission at pre-registration of the staff member who is to supervise. *Credit, 3.*

392 (II). FREEDOM OF THE PRESS.
Seminar in freedom of the press: (1) its history, (2) major theories, (3) key cases in Anglo-American law, and (4) recent trends toward its redefinition. 3 class hours. *Credit, 3. Mr. Musgrave.*

393 (I) or (II). WRITING SEMINAR (Same as English 393).
Individual work under staff supervision for well-qualified juniors and seniors. Prerequisite: Permission at pre-registration of the staff member who is to supervise. *Credit, 3.*

Linguistics

Acting Chairman of Program. Associate Professor Donald C. Freeman.

Although there is no undergraduate major in Linguistics, there are courses offered for those who wish to prepare themselves for graduate work in the field or in anthropology, computer science, English, the foreign languages, philosophy, psychology, or speech. In addition to the courses listed below, many other departments offer related courses.

201 (I) (II). GENERAL LINGUISTICS (C).

A comprehensive treatment of the field of linguistics. The nature of language. Some language universals. Phonology, syntax, and other aspects of modern language theory. By permission may be counted for major credit in English, German, Romance Languages, Speech, and Psychology. 3 class hours.

Credit, 3. Mr. Freeman.

202 (I). PHONOLOGICAL THEORY.

Introduction to the theoretical and psychological bases of contemporary phonological analysis; the concepts of the distinctive feature analysis. Prerequisite, Linguistics 201 or permission of instructor. 3 class hours.

Credit, 3. Mr. Demers.

203 (II). SYNTAX.

An examination of the methods of word and sentence formation; the notions of grammaticality and of well-formed utterances. Prerequisite, Linguistics 201 or permission of instructor. 3 class hours.

Credit, 3. Mr. Binnick.

204 (II). FIELD METHODS.

The methodology of doing linguistic work in the field; preparing questionnaires; analysis of data; use of the tape recorder. Prerequisite, permission of instructor. 3 class hours.

Credit, 3.

RELATED COURSES

ANTHROPOLOGY 105.

ENGLISH 312; 321; 323.

GERMAN 259; 266.

PHILOSOPHY 125; 281; 282.

PSYCHOLOGY 221.

SLAVIC LANGUAGES 263; 265.

SPEECH 181; 284.

Mathematics and Statistics

Head of Department: Professor Wayman L. Strother.

Mathematics Faculty: Professors Marshall H. Stone (George David Birkhoff Chair of Mathematics), Chen, Cohen, Fischer, Foulis, Jacob, Kundert, Wagner, Whaples; Associate Professors Allen (Associate Head), Cullen, Dickinson, Hayes, Holland, Janowitz, Liu, Mann, Martin-

dale, Randall, Su, Wang; Assistant Professors Becker, Borrego, Broshi, Buckley, Catlin, Connors, Cook, Coury, Douglass, Eisenberg, Hedlund, Hertz, Hurt, Joiner, Jones, Killam, King, Ku, Lavallee, McGuigan, McKibbin, Piziak, Reed, Salter, Sicks, St. Mary, Stockton, Storey, Weaver; Instructors Burleson, Bussel, Egan, G. Ferland, Maecher, Malone, Maulucci, McCormack, Naylor, Neenan, Shafer; Lecturers Curtis, Desmarais, K. Ferland, Ford, Jeffcott, Morash, Mulvihill, Rhie, Schneider, Shelden, Skinner, Stenson, Sumner, Urban, Wakin, Will.

Statistics Faculty: Professors Guttman, Oakland, Skibinsky; Assistant Professors Horowitz, Kleye; Instructor Lew.

MATHEMATICS

The minimal requirements for a major in mathematics are the successful completion of: 1) Mathematics 174 or 186 and 2) eight upper division courses in mathematics, exclusive of Mathematics 285, and 286, but which must include Mathematics 200, 211, 212, and 325. Since Mathematics 200 is a prerequisite for many of the upper division courses, it is suggested that this course be taken as early as possible—concurrently with Mathematics 173 or 174 in most cases.

The above minimal requirements are not sufficient for the student who intends to continue his study of mathematics in a graduate school. Such continuing mathematics majors should take Mathematics 326 and at least one of Mathematics 362 or 363 in addition to the courses specified in the above minimal program. Mathematics 381 is not an appropriate course for a continuing mathematics major.

011. ELEMENTARY COLLEGE ALGEBRA.

For those students who offer only one unit of algebra for entrance. A review of elementary algebra and a more thorough study of such topics as quadratic equations, exponents and radicals, and progressions. No college credit is given for this course.

Credit, 0.

021. ALGEBRA AND TRIGONOMETRY.

Fractions, quadratic equations, exponents, logarithms, variation, determinants of the second and third orders, and plane trigonometry. 3 class hours.

Credit, 0. (See Math 121).

100. MATHEMATICS IN THE MODERN WORLD (E).

A cultural and historical presentation of some mathematical ideas to demonstrate both the scientific and the humanistic value of the subject. 3 class hours.

Credit, 3.

110. ELEMENTARY TECHNIQUES OF MATHEMATICS (E).

Some basic techniques including sets, logic, numbers, counting, probability, functions, and graphs. A student cannot receive credit for this course and either of the courses 111 or 112 3 class hours.

Credit, 3.

111. INTRODUCTORY MATHEMATICS (E).

Basic set-theoretic and axiomatic concepts, number systems and equations. A study of elementary functions, by the methods of algebra and analytic geometry. 3 class hours. *Credit, 3.*

112. FINITE MATHEMATICS (E).

Probability, vectors and matrices, and an introduction to linear programming. Prerequisite, Mathematics 111. 3 class hours. *Credit, 3.*

113. SURVEY OF CALCULUS (E).

Differentiation, integration, and applications. Not recommended for students who can take a more complete course in calculus; a student cannot receive credit for this course and either of the courses 123 or 135. Prerequisite, Mathematics 111. *Credit, 3.*

115. ELEMENTARY LINEAR ALGEBRA (E).

Systems of linear equations. Vector spaces, with emphasis on Euclidean spaces. Linear transformations and matrices. Determinants. Characteristic vectors. Designed as an elective for students in School of Business Administration, Industrial Engineering, Economics. 3 class hours. Credit will not be allowed for both this course and Mathematics 212. *Credit, 3.*

116. CALCULUS FOR BUSINESS AND SOCIAL SCIENCES I (E).

Sets, real numbers, inequalities, relations and functions, sequences, series, limits, differentiation and applications. 3 class hours. *Credit, 3.*

117. CALCULUS FOR BUSINESS AND SOCIAL SCIENCES II (E).

Functions of several variables, maxima and minima, exponential and logarithmic functions, integration, introduction to differential equations and difference equations. Prerequisite: Mathematics 116. 3 class hours. *Credit, 3.*

121. ALGEBRA AND TRIGONOMETRY.

Same content as Math 021, except Math 121 carries 3 credits. This course is not open to students majoring in any department of the College of Arts and Sciences or having entrance credit in trigonometry. *Credit, 3.*

122. MATH 123 REMEDIAL (E).

Intended for students with weakness in high school mathematics. Same topics as Math 123, plus remedial work as needed. 4 class hours. *Credit, 3.*

123. ANALYTIC GEOMETRY AND CALCULUS I (E).

Introduction to analytic geometry, functions and graphs, continuity, limits, derivatives of algebraic functions, maxima and minima, primitives. Prerequisites: high school algebra and plane geometry. 3 class hours. *Credit, 3.*

124. ANALYTIC GEOMETRY AND CALCULUS II (E).

Integrals and applications; trigonometric, logarithmic, and exponential functions; techniques of integration. Prerequisites: Math 123 and trigonometry. 3 class hours. *Credit, 3.*

125. MATH 124 REMEDIAL (E).

Intended for students with weakness in trigonometry and/or algebra. Same topics as Math 124, plus remedial work as needed. 4 class hours. *Credit, 3.*

141. MATHEMATICS OF FINANCE (E).

The mathematical principles of simple and compound interest, annuities, depreciation, valuation of bonds, and insurance. 3 class hours. *Credit, 3.*

151. BASIC CONCEPTS OF ALGEBRA (E).

The real numbers as a field. Linear and quadratic equations and inequalities. Systems of linear equations and inequalities. Congruence. Complex numbers. Polynomials. Algebraic structures. Functions. Highly recommended for prospective elementary school teachers. Prerequisite, Mathematics 111. 3 class hours. *Credit, 3.*

173. ANALYTIC GEOMETRY AND CALCULUS III (E).

Infinite sequences and series; vectors; polar, cylindrical and spherical coordinates; conic sections; vector-valued functions. Prerequisite: Math 124. 3 class hours. *Credit, 3.*

174. ANALYTIC GEOMETRY AND CALCULUS IV (E).

Functions of several variables; partial derivatives; multiple integrals; Green's Stokes', and Gauss' Theorems. Prerequisite: Math 173. 3 class hours. *Credit, 3.*

186. ANALYTIC GEOMETRY AND CALCULUS FOR ENGINEERS IV (E).

Partial derivatives, multiple integrals, infinite series. Prerequisite, Mathematics 185. 3 class hours. *Credit, 3.*

187. ELEMENTARY DIFFERENTIAL EQUATIONS FOR ENGINEERS (E).

Corequisite, Mathematics 173 or 185. 3 class hours. *Credit, 3.*

200. FUNDAMENTAL CONCEPTS OF MATHEMATICS (E).

Non-axiomatic propositional calculus (with truth tables), basic quantification theory and set algebra. Binary relations, equivalence relations, partitions, functions. Development of the basic algebraic and topological features of the real numbers from the axioms for a complete ordered field. Prerequisite, permission of instructor. 3 class hours. *Credit, 3.*

202. INFORMAL GEOMETRY (E).

Geometry as a deductive system. Axioms of incidence. Elementary theorems concerning points, lines, and planes. Congruence and measurement of segments and angles. Congruence of triangles and geometric construction. Parallels and parallelograms. Three dimensional figures. Similarity. Area and volume measurement. Elements of spherical and plane analytic geometry. Not appropriate for continuing Mathematics majors. Prerequisite, Mathematics 111. 3 class hours. *Credit, 3.*

211. INTRODUCTION TO MODERN ALGEBRA I.

Introduction to semigroups, groups, rings, fields and modules. Prerequisite, Mathematics 200. 3 class hours. *Credit, 3.*

212. INTRODUCTION TO MODERN ALGEBRA II.

Continuation of Mathematics 211. Finite dimensional vector spaces, linear transformations, elementary theory of matrices and determinants. Prerequisite, Mathematics 211. 3 class hours. *Credit, 3.*

221. VECTOR ANALYSIS.

The algebra and calculus of vectors with applications to physics and other fields. Prerequisite, Mathematics 174 or 186. 3 class hours. *Credit, 3.*

233. PROBABILITY.

A postulation study of probability, including counting methods, random variables; additional topics chosen from Bayes' theorem, statistical independence, laws of large numbers and Markov processes. Corequisite, Mathematics 174 or 186. 3 class hours. *Credit, 3.*

245. APPLIED MATHEMATICS I.

Topics from engineering and mathematical physics presented rigorously and with free use of abstract mathematical concepts and modern mathematical machinery. Prerequisites, Mathematics 200 and Mathematics 174 or 186. 3 class hours. *Credit, 3.*

246. APPLIED MATHEMATICS II.

Continuation of Applied Mathematics I. Prerequisite, Mathematics 245. 3 class hours. *Credit, 3.*

251. NUMERICAL ANALYSIS I.

A first course in techniques of numerical approximation in analysis and algebra. Prerequisites, Mathematics 186 or 174, and Computer Science 121 or 131 or knowledge of basic FORTRAN. 3 class hours. *Credit, 3.*

252. NUMERICAL ANALYSIS II.

Continuation of Mathematics 251, including numerical solution of partial differential equations. Prerequisite, Mathematics 251. 3 class hours. *Credit, 3.*

257. LINEAR PROGRAMMING AND THEORY OF GAMES.

The Simplex Method and extensions, duality theorems, transportation problems and other applications. Finite two-person zero-sum games and the fundamental theorem. Prerequisite, junior-senior standing in Mathematics or permission of instructor. 3 class hours. *Credit, 3.*

285. SURVEY OF ADVANCED MATHEMATICS
FOR ENGINEERS.

Series solution of differential equations, boundary value problems, functions of several variables, partial differential equations, numerical analysis and the Laplace transform. Not available for majors in Mathematics. Prerequisites, Mathematics 186 and 187. 3 class hours. *Credit, 3.*

286. SURVEY OF ADVANCED MATHEMATICS
FOR ENGINEERS.

Vectors and vector spaces, vector field theory, complex analysis. Not available for majors in Mathematics. Prerequisite, Mathematics 285. 3 class hours. *Credit, 3.*

311. LINEAR ALGEBRA.

Row equivalence, linear transformations and matrices, Similarity. Invariant subspaces, cononical forms. Inner product spaces, linear functionals, the spectral theorem. Bilinear forms. Prerequisite, Mathematics 212. 3 class hours. *Credit, 3.*

312. THEORY OF GROUPS.

Topics in group theory to be chosen from: Sylow theorems, Abelian groups, transformation groups, finite groups, representations of groups, characters and orthogonality relations. Prerequisite, Mathematics 212. 3 class hours. *Credit, 3.*

313. THEORY OF NUMBERS.

Euclid's Algorithm, theory of prime numbers, aliquot parts, congruences, further topics in number theory. Prerequisite, Mathematics 200. 3 class hours. *Credit, 3.*

325. INTRODUCTORY MODERN ANALYSIS I.

Basic topology of Euclidian n-space. Convergence of sequences and sequences of functions. Continuous functions; local and global properties. Prerequisites, Mathematics 200 and 174. 3 class hours. *Credit, 3.*

326. INTRODUCTORY MODERN ANALYSIS II.

Differentiation of vector-valued functions. Mapping theorems and extremum properties. Riemann-Stieltjes integral. Integration in Euclidean n-space. Prerequisite, Mathematics 325. 3 class hours. *Credit, 3.*

341. FOURIER SERIES AND ORTHOGONAL FUNCTIONS.

Solutions of boundary value problems by Fourier series. Bessel functions, Legendre polynomials; convergence of representations by orthogonal functions. Prerequisites, Mathematics 174 or 186, and differential equations or linear algebra. 3 class hours. *Credit, 3.*

343. ORDINARY DIFFERENTIAL EQUATIONS.

First and second order differential equations, linear equations power series solutions, existence and uniqueness, plane autonomous systems, stability, Sturm-Liouville systems, eigenvalues and eigenfunctions. Prerequisite, Mathematics 174 or 186. 3 class hours. *Credit, 3.*

362. HIGHER GEOMETRY.

Topics chosen from projective geometry, affine geometry, convex sets, continuous geometry. Prerequisites, Mathematics 200 and 212. 3 class hours. *Credit, 3.*

363. DIFFERENTIAL GEOMETRY.

Differential geometry of curves and surfaces in Euclidean 3-space using vector methods. Prerequisites, Mathematics 212 or permission of instructor. 3 class hours. *Credit, 3.*

371. SET THEORY.

Basic properties of sets. Ordered sets. Complete ordered sets. Well-ordered sets. Cardinal and ordinal numbers. Axiom of choice, well-ordering theorem, Zorn's Lemma and other forms of the axiom of choice. Cardinal arithmetic. Corequisite, Mathematics 325, or permission of instructor. 3 class hours. *Credit, 3.*

381. APPLIED COMPLEX VARIABLES.

The algebra of complex numbers, the elementary functions and their mappings, differentiation, integration, Taylor series, and residues. Applications to physics and engineering. Not an appropriate course for continuing Mathematics majors. Prerequisite, Mathematics 186. 3 class hours. *Credit, 3.*

385, 386, 387, 388. ADVANCED TOPICS.

Several topics intended for individuals or small groups of students. Admission by permission of the head of the department.

Credit, 1, 2, or 3 each semester.

STATISTICS

There is no undergraduate major in statistics. The curriculum is intended for those who wish to prepare themselves for graduate work in statistics and for those who require statistics as a basic preparation for their own subject-matter discipline. Cognate courses are needed to supply a basis for mature thinking. The statistical specialist should choose, according to his interests, cognate courses from such fields as: animal and plant breeding, biology, computer science, econometrics, engineering, genetics, mathematics, market research, psychology, and sociology. Students who expect to do graduate work in statistics should take Statistics 315 and 316 no later than their senior year.

Statistics leans heavily on mathematics and most of the prerequisites for the advanced statistics courses will come from Mathematics 174 or 186 (calculus,) Mathematics 343 (differential equations), and a course in matrix algebra such as Mathematics 311.

121 (I) (II). ELEMENTARY STATISTICS (E).

Nature of statistics; description of data; sample distribution; statistical theories and dispersion procedures; regression and correlation, time series. Not open to students who have completed Statistics 315, Psychology 241 or 245, or Sociology 247. Students with calculus background should elect Statistics 315, 316. 3 class hours.

Credit, 3.

231. INTRODUCTION TO FUNDAMENTALS OF STATISTICAL INFERENCE I.

Random experiments and probability models; independence; conditional probability; sampling; random variables; data representations; special distributions; deduction and inference. 3 class hours.

Credit, 3.

232. INTRODUCTION TO FUNDAMENTALS OF STATISTICAL INFERENCE II.

Point, interval and model estimation; hypothesis testing; optimality concepts; power; least squares techniques; decision theoretic notions. Prerequisite, Statistics 231. 3 class hours.

Credit, 3.

251 (II). ELEMENTARY STATISTICS (E).

Analysis of variance; design of experiments; sample surveys, multiple regression, non-parametric tests. Not open to students who have completed Statistics 315 or Psychology 245. Prerequisite, Statistics 121. 3 class hours.

Credit, 3.

261 (I). DESIGN OF EXPERIMENTS (Methods).

Purpose of experimental designs and their basic assumptions; individual comparisons, components of error, confounding; applications from various fields. Prerequisite, Statistics 121 or 315. 3 class hours.

Credit, 3.

262 (II). ADVANCED STATISTICAL ANALYSIS OF EXPERIMENTAL DATA.

Analysis of data with disproportionate subclass numbers. Includes the method of fitting constants, the method of weighted squares of means, absorption of equations, expectations of mean squares, and tests of hypotheses. Prerequisite, Statistics 261. 3 class hours.

Credit, 3.

271 (I). SURVEY SAMPLING.

Theory and practice of sampling; optimum allocation of resources, estimation of sample size, various sampling methods, ratio and regression estimates, problem of non-response. Prerequisite, Statistics 121 or 315. 3 class hours.

Credit, 3.

272 (II). SAMPLING THEORY AND METHODS.

Problems and methods of samplings; production and quality control, acceptance sampling, OC and ASN curves, types and properties of estimators. Prerequisite, Statistics 121 or 315. 3 class hours.

Credit, 3.

281 (II). MULTIVARIATE ANALYSIS (Methods).

Applications of the theory in Statistics 282 to actual problems; it may involve research studies by the students, critiques of published research, or analysis of other bodies of data. Prerequisite, Statistics 251 or 315. 3 class hours.

Credit, 3.

282 (II). MULTIVARIATE ANALYSIS (Theory).

Correlation and regression, principal components, canonical analysis, analysis of dispersion and covariance, tests of homogeneity, discriminant functions. Prerequisite, Statistics 315. 3 class hours.

Credit, 3.

315 (I). INTRODUCTION TO THE THEORY OF STATISTICS.

Distributions of random variables, conditional probability and stochastic independence, characteristic functions, sampling distributions of common statistical estimators, transformation of random variables. Prerequisite, Mathematics 174 or 186. 3 class hours.

Credit, 3.

316 (II). INTRODUCTION TO THE THEORY OF STATISTICS.

Interval estimation, point estimation, sufficient statistics, tests of hypothesis, the analysis of variance, the multivariate normal distribution of quadratic forms and linear statistical models. Prerequisite, Statistics 315. 3 class hours.

Credit, 3.

Microbiology

Head of Department: Professor C. D. Cox, Professor Thorne; *Associate Professors* Canale-Parola, Dowell, Mortlock; *Assistant Professors* Czarnecki, Holt, Lessie, Pfau, Wilder; *Instructor* Boggs.

Microbiology majors are required to have broad training in collateral sciences, and minimum requirements include chemistry through quantitative analysis and organic, one year each of introductory biological science and physics, and mathematics through calculus. Those students contemplating graduate study will be advised to emphasize

stronger training in these collateral sciences, especially physical chemistry and biochemistry. Courses in microbiology are designed to offer fundamental training in the basic core areas and disciplines of this field. Microbiology 250, 280, 310, 340, 391, and 392 are required of majors.

140 (I) (II). BIOLOGY OF MICROORGANISMS (E).

General considerations of the microbial world, including history, structure, growth, ecology, physiology, pathogenesis, and microbial genetics. Lectures supplemented with visual aid material. 3 class hours.

Credit, 3. Staff.

141 (I) (II). BIOLOGY OF MICROORGANISMS.

Open only to nursing students concurrently registered for Microbiology 140. 1 3-hour laboratory period.

Credit, 1. Mr. Czarnecki.

250 (I) (II). GENERAL MICROBIOLOGY I.

General considerations of microbial structure, growth and physiology, and the reactions of microorganisms to their physical, chemical and biological environments. Designed for students intending to take more advanced courses in microbiology and for other science majors. Prerequisites, Chemistry 262 and 264, 166 and 168, or 160 and one semester of biological science. 2 class hours, 2 3-hour laboratory periods.

Credit, 4. Mr. Canale-Parola, Mr. Mortlock.

260 (I). GENERAL MICROBIOLOGY II.

Principles of selective enrichment and isolation; morphological, physiological and ecological characteristics of a number of microbial groups isolated from nature. Prerequisite, Microbiology 250. 2 class hours, 2 3-hour laboratory periods.

Credit, 4. Mr. Canale-Parola.

280 (II). PATHOGENIC BACTERIOLOGY.

Correlation of physiologic, metabolic, and immunologic properties of bacteria with pathogenesis of disease. Prerequisite, Microbiology 250. 2 class hours, 2 3-hour laboratory periods.

Credit, 4. Mr. Wilder.

310 (I). IMMUNOLOGY.

Fundamental study of nature of antigens and antibodies, their interactions and significance in resistance and hypersensitivity. Prerequisite, Microbiology 250. 2 class hours, 2 3-hour laboratory periods.

Credit, 4. Mr. Cox.

320 (II). VIROLOGY.

Structure, and chemical, physical and biological properties of viruses. Prerequisite, Microbiology 250, or permission of instructor. 2 class hours, 2 3-hour laboratory periods.

Credit, 4. Mr. Pfau.

340 (II). MICROBIAL PHYSIOLOGY.

Fundamental studies of microbial chemistry and growth. Composition of bacterial cells, energy metabolism, biosynthesis of macromolecules and macromolecule precursor materials, and regulatory mechanisms governing these events. Prerequisite, Microbiology 250 or permission of instructor. 3 class hours.

Credit, 3. Mr. Lessie, Mr. Mortlock.

387, 388 (I) (II). SENIOR RESEARCH.

Prerequisites, 8 credits of Microbiology and departmental permission.

Credit, 2-4. Staff.

391, 392 (I) (II). SEMINAR.

Prerequisite, Microbiology 250.

Credit, 1. Staff.

Music

Head of Department: Professor Philip Bezanson. Professors Alviani, King; Associate Professors Contino, du Bois (Assistant Head); Resident Artist Julian Olevsky; Lecturer Estela Olevsky; Assistant Professors Jenkins, Krosnick, Lehrer, Ornest, Steele, Stern, Weed, Whaples; Instructors Chesnut, d'Armand, Fussell, Harler.

The Music Department offers the Bachelor of Music degree and the Bachelor of Arts degree. A student must apply to the department for admission. An audition is required of all applicants.

The Bachelor of Music degree may be earned with one of three areas of concentration: performance, theory-composition, or music education. The three programs have a considerable part (91 credits) in common: The University core requirements (33 credits—36 when Music 111 is counted as the "C" course), a series of background courses in Music (58 credits) consisting of theory courses 111, 112, 113, 114, 211, 212, 215 and 216 (23 credits), music history and literature courses 102, 201 and 202 (9 credits), performance courses each semester (24 credits), and course 363, Conducting, (2 credits).

The additional requirements for a concentration in performance are: music courses 217, 385, 386, 18 credits in performance, and 12 elective credits, 6 of which may not be music credits (totalling 129 credits). A senior solo recital is required.

The additional requirements for a concentration in music education depend upon whether the student's primary skill is vocal or instrumental. In either case, 5 additional credits in performance work and 15 credits for the teacher certification courses are required. For voice students, 16 credits in music education, 6 credits in Italian, and 6 elective credits (totalling 139 credits) are required. For instrumental students, 7 credits in music education, 18 credits in instrumental techniques and 3 elective credits (totalling 139 credits) are required.

The Bachelor of Arts program for a music major is pre-professional, serving the needs of the student who wishes to broaden his cultural background. All majors will take 111, 112, 113, 114, 201, 211, 212, and must register for applied music and either band, orchestra, or chorus every semester. The student will choose as his area of concentration, music history, theory, or applied music. The junior-senior years will include a sequence of advanced

courses suggested by the department. Students whose major area is applied music are required to present a senior solo recital.

Majors in other departments may elect a minor in music. This program should include 111, 112, 201, 202, and 4 credits in ensemble or individual applied music. Education majors, upon completion of 111–112, should elect 242 in lieu of 201.

The band, orchestra, chorus, and various small ensemble groups are open to all University students who wish to participate in a performing organization.

HISTORY AND APPRECIATION

101 (I) (II). INTRODUCTION TO MUSIC (C).
Open to all students not majoring in music. Previous musical training is not required. Basic music materials, principles of design, and cultural significance of representative works from the Ninth Century to the present are studied and discussed. 3 class hours. *Credit, 3.*

102 (I). LITERATURE OF MUSIC (C).
Review of music materials and principles of design. Emphasis on important examples of vocal music, keyboard music, chamber music, symphonies, concertos and operas from the Renaissance through the present time. Brief reference will also be made to Pre-Renaissance music. Listening and analysis. Prerequisite, for music majors or permission of the instructor. 3 class hours. *Credit, 3.*

201 (I), 202 (II). HISTORICAL SURVEY OF MUSIC.
History and literature of music: Music 201, from early religious chant through Bach and Handel; Music 202, from 1750 through vocal and instrumental music of the 20th Century. Prerequisite, permission of the instructor, or Music 112. 3 class hours. *Credit, 3.*

203 (I). MUSIC FROM MONTEVERDI TO BACH.
Baroque and Rococo periods, including music of such composers as Monteverdi, Schutz, Lully, Purcell, Corelli, Couperin, Rameau, the Scarlattis, Bach, Handel. Prerequisite, Music 201 and permission of instructor. 3 class hours *Credit, 3.*

205 (I). GOTHIC AND RENAISSANCE MUSIC.
Chant and organum through Renaissance motet and madrigal. Reading, listening, score study, analysis. Prerequisite, Music 201 and permission of instructor. 3 class hours *Credit, 3.*

209 (I) (II). MUSIC OF THE 20TH CENTURY.
European and American music written since 1900, including Stravinsky, Bartok, Hindemith, Copland, jazz, electronic music. Prerequisite, Music 202 and permission of instructor. 3 class hours. *Credit, 3.*

301 (II). HAYDN, MOZART AND BEETHOVEN.
Reading, listening, score study. Prerequisite, Music 202 and permission of instructor. 3 class hours. *Credit, 3.*

302 (II). MUSIC FROM SCHUBERT TO DEBUSSY.
An historical study of 19th Century romantic music in small and large forms, and various media including lieder, chamber music, symphony, opera. Reading, listening, score study. Prerequisite, Music 202. 3 class hours. *Credit, 3.*

303. HISTORY OF OPERA.
History of Opera from the late 16th to the present century. Prerequisite, permission of instructor. 3 class hours. *Credit, 3.*

THEORY

111 (I), 112 (II). ELEMENTARY MUSIC THEORY (111: C).
Diatonic harmony and development of skills in sight singing, ear training, analysis and composition. Prerequisites, ability to read music, elementary skill at playing the piano, or permission of instructor. Music 111 including ear-training prerequisite to Music 112. *Credit, 3.*

113 (I), 114 (II). INTERMEDIATE MUSIC THEORY.
Harmony and counterpoint including further studies in sight singing and ear training. Further analysis of musical forms, including contrapuntal forms, and practice in writing original compositions. Prerequisite, Music 112 or its equivalent; Music 113 including ear-training prerequisite to Music 114. *Credit, 3.*

211 (I), 212 (II). ANALYSIS OF MUSIC LITERATURE.
Representative comparisons from the Baroque and Classic periods, second semester from the Romantic and Contemporary periods. Analysis by score and sound of various musical forms and media developed in each period. Prerequisite, Music 114. Non-music majors must obtain permission of instructor. 3 class hours. *Credit, 3.*

215 (I). COUNTERPOINT.
The study of the techniques of 16th Century modal counterpoint. Analysis, listening, and written assignments. Prerequisite, Music 114. 3 class hours. *Credit, 3.*

216 (II). ORCHESTRATION.
Problems in scoring for various ensembles including full orchestra. Prerequisite, Music 114 or permission of instructor. 2 class hours. *Credit, 2.*

217 (I). CONTEMPORARY TECHNIQUES.
The examination of melody, rhythm, harmony, and form in 20th Century music. Analysis, listening, and written assignments. Prerequisite, Music 114. 2 class hours. *Credit, 2.*

311 (I), 312 (II). COMPOSITION.
Free composition in various forms and media. Individual lessons. Weekly Seminar. Prerequisite, permission of instructor, Music 114. 3 class hours. *Credit, 3.*

385 (I), 386 (II). SPECIAL PROBLEMS IN MUSIC.
Advanced studies in Composition and Theory, History, or Literature may be pursued by qualified students under the direction of a faculty member of the department. *Credit, 1–3.*

MUSIC EDUCATION

118 (I), 119 (II). VOICE CLASS.

Vocal Techniques. Open to instrumental music majors only. 1 class hour. *Credit, 1.*

221-229 (I) (II). INSTRUMENTAL TECHNIQUES.

Class lesson in Violin*. Materials and methods of teaching, Open to music majors only. 3 class hours, 2 laboratory hours. *Credit, 2.*

221—Violin*

226—Horn*

222—Cello*

227—Trumpet*

223—Flute*

228—Trombone*

224—Oboe* (Bassoon)*

229—Percussion*

225—Clarinet*

231 (I) (II). MUSIC FOR ELEMENTARY TEACHERS.

For the classroom teacher having little or no formal training in music. Principles of musical development with particular emphasis on classroom presentation. Rote and reading songs examined; processes of presentation evaluated. 3 class hours. *Credit, 3.*

241 (I). INSTRUMENTAL MUSIC IN ELEMENTARY AND JUNIOR HIGH SCHOOL.

Materials and methods of instrumental music teaching. 3 class hours. *Credit, 3.*

242 (I). CLASSROOM MUSIC IN THE ELEMENTARY AND JUNIOR HIGH SCHOOL.

Introduction to materials and methods. Open to Music Education majors and minors. 3 class hours. *Credit, 3.*

243 (II). CHORAL AND CLASSROOM MUSIC IN THE SENIOR HIGH SCHOOL.

Materials and methods of high school choral and classroom music. 3 class hours. *Credit, 3.*

244 (II). INSTRUMENTAL MUSIC IN THE SENIOR HIGH SCHOOL.

Materials and methods of instrumental music teaching. 3 class hours. *Credit, 3.*

245 (II). VOCAL PEDAGOGY.

Methods of teaching voice production. Prerequisite, 3 years of voice study. 1 class hour. *Credit, 1.*

363 (II). BASIC CONDUCTING.

Introduction to conducting. Prerequisite, Music 211. 3 class hours. *Credit, 2.*

364 (I). INSTRUMENTAL CONDUCTING.

Rehearsal techniques and conducting of instrumental ensembles. Prerequisite, Conducting 363. 2 class hours. *Credit, 2.*

365 (I). CHORAL CONDUCTING.

Rehearsal techniques and conducting of vocal ensembles. Prerequisite, Conducting 363. 2 class hours. *Credit, 2.*

APPLIED MUSIC

Registration in Applied Music courses requires prior permission of the department. Music majors are not charged additional fees for applied lessons or practice rooms.

120 (I) (II). PIANO CLASS.

Piano proficiency. Required of all music majors. Not open to non-majors. By examination, or no more than four hours credit allowed. 1 class hour. *Credit, 1.*

121-138* (I) (II). INDIVIDUAL INSTRUCTION.

Piano, voice, organ, strings, woodwinds, brasses, or percussion. Attention given to development of performance skills and study of appropriate literature. Student recitals provide an opportunity for frequent public performance. *Credit, 1-4. Staff.*

	Strings	Woodwinds	Brasses
121 Piano	124 Violin	128 Flute	133 Trumpet
122 Organ	125 Viola	129 Oboe	134 French Horn
123 Voice	126 Cello	130 Clarinet	135 Trombone
	127 Bass	131 Bassoon	136 Baritone Horn
		132 Saxophone	137 Tuba
			138 Percussion

161* (I) (II). UNIVERSITY CHORALE.

A cappella choir selected by audition. Preparation and performance of choral literature ranging from the Renaissance to Contemporary. Concerts on campus and on tour. Three rehearsals a week. Chamber Singers selected from this group. May be repeated for credit. *Credit, 1. Mr. du Bois.*

162* (I) (II). UNIVERSITY CHORUS.

Open to all students. Preparation and concert performance of oratorios and other large choral works. Two rehearsals a week. Madrigal Singers selected from this organization. *Credit, 1. Mr. Harler.*

165* (I) (II). WOMEN'S CHOIR.

A select choir specializing in choral literature for women's voices. Audition required. *Credit, 1. Mr. Harler.*

167 (I) (II). CHAMBER SINGERS.

Vocal ensembles specializing in performance of chamber music from Renaissance to Contemporary. Audition required. *Credit, 1.*

168 (I) (II). MADRIGAL SINGERS.

Vocal ensemble specializing in music of the Renaissance. Audition required. *Credit, 1.*

171* (I) (II). UNIVERSITY ORCHESTRA.

Preparation and performance of orchestral literature of various styles and periods. *Credit, 1. Mr. Steele.*

*May be repeated for credit. A maximum of four credits earned in applied music courses may be counted as credit toward graduation by students who are not music majors.

181* (I). MARCHING BAND.

Preparation and performance of pre-game and half-time shows during football season. Prerequisite: attendance at pre-season band camp and permission of conductor. Freshmen and sophomores may elect Marching Band in lieu of required Physical Education during the marching season. *Credit, 1.* Mr. Jenkins.

182* (I) (II). SYMPHONY BAND.

Preparation and performance of band and wind ensemble literature of various styles and periods. *Credit, 1.* Mr. Jenkins.

183* (I) (II). CONCERT BAND.

Preparation and limited performance of selected band literature. *Credit, 1.* Mr. Weed.

187* (I) (II). ENSEMBLE.

Preparation and performance of appropriate literature for small instrumental and vocal ensembles. *Credit, 1.* Staff.

Philosophy

Head of Department: Professor Bruce Aune. Professors Ackermann, Matthews, Shute, Sleigh; Associate Professors Gettier, Heidelberger, Robison; Assistant Professors A. Brentlinger, J. Brentlinger, Clay, Ehrlich, Feldman, Foster.

105 (I) (II). INTRODUCTION TO PHILOSOPHY (C).

An introduction to some of the most important of the general questions, ideas, theories, and methods of inquiry which have given direction to Western thought. 3 class hours. *Credit, 3.*

110 (I) (II). ETHICS (C).

An examination of classical and contemporary theories concerning policy formation and the justification of personal decisions and ways of life. 3 class hours. *Credit, 3.*

125 (I) (II). INTRODUCTION TO LOGIC (E).

An inquiry into the nature of critical thinking, including the functions of language, the structure of deductive arguments, and a glimpse at inductive methods. 3 class hours. *Credit, 3.*

161 (I). HISTORY OF PHILOSOPHY—ANCIENT AND MEDIEVAL (C).

The development of Western thought from its earliest beginnings to the flowering of medieval scholasticism. Emphasis on the contribution of important movements and great thinkers. 3 class hours. *Credit, 3.*

162 (II). HISTORY OF PHILOSOPHY—MODERN (C).

Continuation of Philosophy 161 from the Renaissance and the rise of modern science to 19th century idealism, positivism and voluntarism. 3 class hours. *Credit, 3.*

*May be repeated for credit. A maximum of four credits earned in applied music courses may be counted as credit toward graduation by students who are not music majors.

201 (I). PLATO AND ARISTOTLE (C).

The major works of Plato and Aristotle in ethics, logic, and metaphysics will be read for the systematic character of their thought and its contemporary relevance. Prerequisites, one semester course in philosophy other than 125. 3 class hours. *Credit, 3.*

202 (II). PHILOSOPHY IN THE MIDDLE AGES (C).

The writings of major philosophers of the period, including Augustine, Aquinas, Duns Scotus, and Ockham; the historical setting and their relevance to modern thought. Prerequisites, one semester course in philosophy other than 125. 3 class hours. *Credit, 3.*

203 (I). EUROPEAN PHILOSOPHY FROM MONTAIGNE TO ROUSSEAU (C).

Representative philosophical texts of the period, with concentration on authors of major historical influence such as Descartes, Spinoza, Leibniz, Pascal. Prerequisites, one semester course in philosophy other than 125. 3 class hours. *Credit, 3.*

204 (II). BRITISH PHILOSOPHY FROM BACON TO HUME (C).

Representative philosophical texts, with emphasis on Locke, Berkeley, Hume and their historical influence, especially on contemporary empiricism. 3 class hours. *Credit, 3.*

205 (II). GERMAN PHILOSOPHY FROM THE ENLIGHTENMENT TO 1914 (C).

Readings of original texts and emphasis on Kant and the nineteenth century. Prerequisite, one semester course in philosophy other than 125. 3 class hours. *Credit, 3.*

218 (II). AMERICAN PHILOSOPHY (C).

Examination, by means of a study of selected original texts by the outstanding American philosophers, of their contribution to Western thought and American civilization. 3 class hours. *Credit, 3.*

225 (I). INDIAN PHILOSOPHIES (C).

Theories of reality, of knowledge, of art and of human destiny in the leading schools of Indian Asia; traditional and contemporary political theory. 3 class hours. *Credit, 3.*

226 (II). EAST ASIAN PHILOSOPHIES (C).

Theories of human nature, society, and the state in philosophies of Chinese and Japanese origin; the modification of Buddhism under the influence of Chinese thought. 3 class hours. *Credit, 3.*

230 (II). PHILOSOPHY OF SCIENCE.

A critical analysis of the structure of scientific method and the language of science, the respective roles of induction and deduction in science, and the status of theoretical terms. 3 class hours. *Credit, 3.*

241 (I). PHILOSOPHY OF RELIGION (C).

Readings in contrasting religious philosophies followed by analysis of concepts involved in understanding religion as coherently related to the other aspects of experience. 3 class hours. *Credit, 3.*

243 (II). AESTHETICS (C).

Leading theories of the nature of art, the analysis of aesthetic experience, the distinctive function of art in culture and personality, and the principles of criticism. 3 class hours. *Credit, 3.*

244. EPISTEMOLOGY.

A critical examination of various accounts of the nature of knowledge, with special attention on basic principles of epistemic logic, probability, and certainty. 3 class hours. *Credit, 3.*

245 (I). METAPHYSICS.

A critical examination of the basic problems of metaphysics. Problems to be discussed will include the nature of necessity, the relation between universals and particulars, the concept of causality, and the relative merits of competing metaphysical views, such as materialism, idealism, and dualism. Prerequisite, Philosophy 105. 3 class hours. *Credit, 3.*

261 (I). CONTEMPORARY ANALYTIC PHILOSOPHY (C).

Russell, Carnap, Wisdom, the later Wittgenstein, Austin, Strawson, Quine. Prerequisite, one semester course in philosophy. 3 class hours. *Credit, 3.*

264 (II). EXISTENTIAL PHILOSOPHIES (C).

Examination by a study of selected original texts of the main problems peculiar to this movement as a whole and to its main exponents individually. Prerequisite, one semester course in philosophy other than 125. 3 class hours. *Credit, 3.*

280 (I). ETHICAL THEORY (C).

Some of the major problems of ethical theory with special emphasis on definition, the status of ethical statements, reasoning and justification in ethics. 3 class hours. *Credit, 3.*

281 (II). MATHEMATICAL LOGIC (E).

Turing machines, theory of computability, effective procedures, combinatorial systems, natural deduction, completeness of quantification theory. Prerequisite, Philosophy 125 or consent of instructor. 3 class hours. *Credit, 3.*

282 (II). THEORY OF FORMAL SYSTEMS (E).

Equivalence, completeness, incompleteness, decision procedures, formal syntax and semantics, recursive function theory, formal number theory, "reduction" of mathematics to logic. Prerequisite, Philosophy 281, its equivalent, or consent of instructor. 3 class hours. *Credit, 3.*

290 (I). POLITICAL PHILOSOPHY.

A systematic approach to major controversies in philosophy of political science and political ethics; e.g., rationalism vs. empiricism, natural law vs. legal positivism. Prerequisite, one semester course in philosophy, or consent of instructor. 3 class hours. *Credit, 3.*

295 (I). CONTEMPORARY PROBLEMS.

Selected persistent philosophical problems—e.g., induction, relation of mind and body, perception, certainty of statements, knowledge of other minds, etc. Prerequisite, one semester course in philosophy. 3 class hours. *Credit, 3.*

385. (I). SPECIAL PROBLEMS.

Individual study of a selected problem in philosophy, with written report of results. Prerequisite, two semester courses, one, at least, numbered above 200, or permission of the department. *Credit, 3.*

390 (I), 391 (II). SEMINAR.

One major philosopher, major philosophical tradition, or restricted subject in a special field of philosophical inquiry. Prerequisite, two semester courses, one at least, numbered above 200, or permission of the department. *Credit, 3.*

392. SENIOR SEMINAR.

One major philosopher, major philosophic tradition or restricted subject in a special field of inquiry. Required for all senior philosophy majors; others admitted by permission of instructor. 3 class hours. *Credit, 3.*

Physics and Astronomy

Acting Head of Department: Professor L. F. Cook. Professors Gluckstern, Harrison, Inglis, Irvine, Jones, Quinton, Rosen, Ross, Strong; Associate Professors Brehm, Byron, Cleland, Engelsberg, Ford, Freytag, Goldenberg, Guyer, Huguenin, Kofler, Krotkov, Penchina, Peterson, Pichanick, Sastry, Schultz, Shafer, Soltysik, Sternheim, Yamamoto; Assistant Professors Army, Crooker, Dent, Gerace, Golowich, Harkness, Hertzbach, Hoffman, Kane, Langley, Mathieson, Mullin, Swift, Taylor, Thiebaux, Walker; Research Associates and Lecturers Goz, Kojoian, Meisner, Tucker, Uesugi, Van Blerkom; Staff Associate Gray.

PHYSICS

100 (I). AN INTRODUCTION TO PHYSICS (E).

Conservation laws; concepts of force, mass-points, momentum, energy, and application to orbits. Electromagnetic radiation, relativity. The discovery of the nucleus. The failures of classical physics; waves and particles. Intended for students who wish to test their interest in physics, including potential high school physics teachers. No prerequisites. 3 class hours. *Credit, 3.*

116 (I). RELATIVITY (E).

As much general physics material as is required for an understanding of the fundamental principles of relativity, and of their consequences in other fields. Intended for the general student. No special background in physics or science is required. Prerequisites, high school algebra and trigonometry. 3 class hours. *Credit, 3.*

117 (II). NUCLEAR ENERGY (E).

Basic concepts of matter and energy. Topics include radiations emitted by atomic nuclei, neutrons and protons, discussion of nuclear forces, accelerators, reactors, nuclear explosives and stars, practical applications of nuclear energy, impact of nuclear science on modern society. No prerequisites other than high school algebra and trigonometry. 3 class hours. *Credit, 3.*

118 (I). ELEMENTS OF QUANTUM PHYSICS (E).

The important principles and ideas of quantum physics. Topics include atoms and their structure, matter waves, duality, Pauli principle, spin, uncertainty principle, role of models in physics, application of concepts of quantum physics to solid state, nuclear and elementary particle physics, philosophical implications. Necessary background of classical physics. No prerequisites except for high school algebra and trigonometry. 3 class hours.

Credit, 3.

121 (I), 122 (II). CONCEPTS OF PHYSICS (E).

Mechanics, sound, heat, electricity, light, atomic and nuclear concepts. Conventional topics may be replaced to suit specific undergraduate majors, in order to emphasize historical, biographical and conceptual rather than mathematical approaches. Physics 121 prerequisite for Physics 122. 2 class hours, 1 2-hour laboratory period.

Credit, 3 each.

141 (I), 142 (II). INTRODUCTORY PHYSICS I, II (E).

Mechanics, sound, heat; electricity, magnetism, light and modern physics, using trigonometry and algebra, but not calculus. Intended for pre-medical, pre-dental, pre-veterinary, and some science major students. Prerequisites, Mathematics 121 previously or concurrently for Physics 141; Physics 141 for Physics 142. 3 class hours, 1 2-hour laboratory period.

Credit, 4 each.

161 (II). GENERAL PHYSICS I (E).

Mechanics. For students primarily interested in engineering, chemistry, or mathematics. Prerequisite, Mathematics 135 previously, or concurrently with special permission. 2 lectures, 2 recitations; 1 2-hour laboratory in alternate weeks.

Credit, 4.

162 (I). GENERAL PHYSICS II (E).

Heat, electricity, and magnetism. Prerequisites, Mathematics 135; Physics 161; Mathematics 136 previously or concurrently. 2 lectures, 2 recitations; 1 2-hour laboratory in alternate weeks.

Credit, 4.

163 (I), (II). GENERAL PHYSICS III (E).

Electromagnetic radiation, optics, atomic and nuclear physics. Prerequisites, Mathematics 136; Physics 162. 2 lectures, 1 recitation; 1 2-hour laboratory period.

Credit, 4.

181 (I), 182 (II). INTRODUCTORY PHYSICS I, II FOR PHYSICS MAJORS (E).

Limited-enrollment course for Physics Majors or others interested in an introductory course at an advanced level. Subjects covered include: vector analysis, laws of mechanics, application to rigid body motion, conservation laws, complex numbers, wave motion, thermodynamics, kinetic theory. Corequisite, Mathematics 123, 124 or equivalent. Consent of Physics Department necessary. 3 class hours, 1 2-hour laboratory period.

Credit, 4 each.

183 (I), 184 (II). INTRODUCTORY PHYSICS III, IV FOR PHYSICS MAJORS (E).

Continuation of 181, 182. Subjects covered include: laws of electricity and magnetism, radiation, light, geometrical and physical optics, relativity, modern physics. Prerequisites, Physics 181, 182; Corequisite, Mathematics 173, 174 or equivalent. 3 class hours, 1 2-hour laboratory period.

Credit, 4 each.

251 (I). ELECTRICITY AND MAGNETISM I.

Classical field theory, static electric fields and magnetic fields of steady currents. Scalar and vector potentials. Laplace's equation and its solutions. Prerequisites, Physics 142, 162, or 183; Mathematics 174 or 186. 3 class hours.

Credit, 3.

252 (II). ELECTRICITY AND MAGNETISM II.

Continuation of 251. Time-varying-fields, Maxwell's equations and applications to radiation. Prerequisites, Physics 251 and Mathematics 187 or 343. 3 class hours.

Credit, 3.

254 (II). METEOROLOGY.

Theoretical treatment of various atmospheric phenomena, with correlation of observation and theory. Weather observations, preparation of weather charts, and weather forecasting. Prerequisites, Physics 142, or 162 or 184; Mathematics 174 or 186. 3 class hours..

Credit, 3.

255 (I), 256 (II). MECHANICS I, II.

Development of the fundamental concepts of dynamics with applications to particles and rigid bodies in translation and rotation. At the level of Becker's Theoretical Mechanics. Prerequisites, Physics 142, or 162 or 184; Mathematics 174 or 186. 3 class hours.

Credit, 3 each.

264 (II). WAVE MOTION.

Presentation of physical optics, acoustics, and other wave phenomena into a single unified structure. Prerequisite, Physics 252. 3 class hours.

Credit, 3.

271 (I), 272 (II). STATISTICAL PHYSICS I, II.

Presentation of thermodynamics, kinetic theory and statistical mechanics into a single unified structure. Prerequisites, Physics 142 or 162 or 184, and Mathematics 174 or 186. 3 class hours.

Credit, 3.

285. MODERN PHYSICS I.

Review of classical mechanics, theory of relativity, black body radiation, photoelectric effect, Compton effect, background for development of quantum mechanics, Bohr atom. Prerequisites, Physics 252, 256. 3 class hours.

Credit, 3.

286 (II). MODERN PHYSICS II AND QUANTUM MECHANICS. Quantum mechanics, application to atomic and nuclear physics, such as atomic spectra, Zeeman effect, angular momentum, barrier penetration. Prerequisite, Physics 285. 4 class hours.

Credit, 4.

288 (I). SOLID STATE PHYSICS.

Introduction to theoretical and experimental physics of the solid state. Prerequisite, permission of instructor. 3 class hours.

Credit, 3.

319 (II). ELECTRONICS INSTRUMENTATION.

A laboratory-oriented course designed expressly for physicists and chemists. Basic electronics principles, servo systems, operational amplifiers, digital circuits, other modern devices. Prerequisite, permission of instructor. 1 class hour, 1 4-hour laboratory period.

Credit, 3.

385 (I), 386 (II). **ADVANCED EXPERIMENTAL WORK I, II.** Selected experiments and projects are investigated, according to the needs of the individual student. Prerequisite, Physics 251. 1 to 3 2-hour laboratory periods. *Credit, 1 to 3 each.*

387 (I), (II). **SPECIAL TOPICS IN ELECTRICAL MEASUREMENTS.** Selected experiments are performed by the student so as to gain experience in methods of electrical measurements. Normally open to junior majors. 1 to 3 2-hour laboratory meetings a week. *Credit, 1 to 3 each.*

ASTRONOMY (A Five-College Department)

Chairman: Professor William M. Irvine. Professors Harrison, Seitter, Strong; Associate Professor Huguenin; Assistant Professors Adler, Arny, Cogan, Dent, Harkness, Taylor; Lecturer van Blerkom.

101 (I). **ELEMENTARY ASTRONOMY (E).** Astronomy 101-102 is designed primarily for students not majoring in the physical sciences. Historical perspective. The solar system, systems of coordinates, laws of motion, planets and satellites, the sun. Cosmogony and current theories on the origin of life. Supplemented by occasional hours of evening observation. 3 class hours, 1 1-hour lab period. *Credit, 3.*

102 (II). **ELEMENTARY ASTRONOMY (E).** The astronomical universe. Astronomical instruments. Stellar distances and motions, star clusters and nebulae. Cosmology. Supplemented by occasional hours of evening observation. 3 class hours, 1 1-hour lab period. *Credit, 3.*

122 (I), (II). **INTRODUCTION TO ASTRONOMY AND ASTROPHYSICS (ASTFC 22).**

For astronomy majors or others interested in a quantitative introductory course. A description of our present knowledge of the universe and the means by which this knowledge has been obtained. The properties of the solar system, individual and multiple stars, interstellar matter, our galactic system, external galaxies, and the possibility of extraterrestrial life. Prerequisite, Physics 113 (or 106, or 104), Math 124 (or 136) or permission of instructor. *Credit, 4.*

231 (I). **SPACE SCIENCE: TOPICS OF CURRENT ASTRONOMICAL RESEARCH (ASTFC 31).**

Intended primarily for students in major program I. A discussion of selected topics from current astronomical research. Choice of topics depends upon the instructor and may include the aims and results of space research and exploration, recent developments in stellar evolution, cosmology, and current research in radio astronomy. The discussion is in depth, but does not require advanced mathematics. Prerequisites, Astronomy 101-102 or 122 and Math 111 or 123. 3 class hours. *Credit, 3.*

234 (II). **DEVELOPMENT OF ASTRONOMY (ASTFC 34).** The progress of astronomy, traced from prehistoric petroglyphs to the space age. Emphasis on the development of important ideas in the field and the relation of astronomy to other cultural

trends. Supplemented by occasional use of the planetarium and the departmental telescopes. Prerequisites, Astronomy 101-102 or 122. *Credit, 3.*

237 (I). **ASTRONOMICAL OBSERVATION (ASTFC 37).**

Intended primarily for students in major Program I. An introduction to the techniques of gathering and analyzing astronomical data. Subjects to be covered depend somewhat on individual interests: fundamental astronomical catalogues and their uses, photography, photometry, spectroscopy and classification of spectra, techniques of planetarium use, basic radio astronomy, introduction to telescope design and use, the astronomical distance scale. Three hours of classroom work per week, some of which will be observing sessions to be arranged. Prerequisite, Astronomy 101-102, or 122, or permission of instructor. *Credit, 3.*

238 (II). **TECHNIQUES OF MODERN ASTRONOMY (ASTFC 38).** An introduction to modern methods of astronomical observation and data reduction. Specific techniques of optical astronomy, radio astronomy, and space astronomy are discussed and analyzed. Laboratory experiments and field observations performed by students during the semester. Prerequisite, Physics 115 or permission of instructor. *Credit, 3.*

343 (I). **ASTROPHYSICS I (ASTFC 43).** Basic topics in astrophysics. Equilibrium configurations and the physical state of stellar interiors. Polytrope models. Interaction of radiation and matter, and radiative transfer. Radiative and convective equilibrium. Study of opacity. Prerequisite, concurrent enrollment in Physics 251 or permission of the department. 4 class hours. *Credit, 4.*

344 (II). **ASTROPHYSICS II (ASTFC 44).** Interaction of matter and radiation. Radiative transfer. Introduction to the physics of stellar and planetary atmospheres. Interplanetary and interstellar particles. Extraterrestrial radio emission. Prerequisite, Astronomy 343, or permission of the department. 4 class hours. *Credit, 4.*

385 (I or II), 386 (I or II). **SPECIAL PROBLEMS.** An individual research project approved by the department. Prerequisite, permission of the department. *Credit, 3.*

Psychology

Head of Department: Professor Kenneth Purcell. Professors D. Appley, M. Appley, Berger, Epstein, Feldman, Helson, Kates, Levinger, J. Myers, Southworth; Associate Professors C. Clifton, Donahoe, Dzendolet, Jarmon, Krickhaus, Moore, Moss (Assistant Head) N. Myers, Phillips, Schumer, Trowill; Assistant Professors Ayres, Carlson, Cashdan, Chumbley, R. Clifton, Daehler, Danielson, Eagly, Emrick, Gadlin, Harmatz, Himmelfarb, Kamil, Kerpelman, Pollatsek, C. Purcell, Turner, Well, Willoughby; Clinical Associates Allen, Ganter, Hellman, Janowitz, Leonard, Oppenheim, Rohan, Rotman, Simon, Tallent, Trehub.

Psychology 101 is the prerequisite entrance course for all psychology students. Both psychology majors and non-majors may then elect any of the following additional courses without further prerequisite: 141, 145, 201, 210, 220, 230, 260, 262, 263, 270, 280, 290, 301, 305, 311, 325.

Students interested in majoring in psychology should elect Psychology 141 following completion of Psychology 101 and may then pursue a general psychology major or one designed for those preparing for graduate study and professional careers in the field.

The *general psychology major* must elect, in addition to Psychology 101 and 141, the following: Psychology 305 and a minimum of 21 (and no more than 27) credits of advanced level courses in the Department. Included in the elections must be at least two courses from each of the following two groupings: A: 210, 220, 230, and 250; and B: 260, 270, and 280. Students completing this major will fulfill the *Departmental requirements* for the Bachelor of Arts degree.

(Note: Students who have entered the B.A. program may elect the additional courses indicated below to complete a "career" major *without* shifting to a B.S. program or they may elect to become B.S. degree candidates if in the balance of their program they choose and are able to meet the *additional science requirements of the College*. Depending on their backgrounds, certain transfer students may have difficulty fulfilling these requirements in the time they have available. Students who are in doubt as to which major or degree programs to follow should discuss the available options with their Faculty Advisers.)

The *career psychology major* must elect the same program as the general psychology major as a minimum. In addition, such students should plan to elect Psychology 145 and at least one laboratory course from each of the following two groupings: A: 211, 221, 222, 231, and 251; and B: 261, 271, 281, and 282. These laboratory electives must be taken in proper sequence with their associated non-laboratory prerequisites or corequisites. Students completing this major will fulfill the *Departmental requirements* for either the Bachelor of Arts or the Bachelor of Science degree.

Students in the "career" program (either B.A. or B.S.) who are otherwise eligible will be encouraged to participate in the Honors Program in their junior and senior years.

Selected majors in either program may from time to time be invited to participate in Special Problem programs, the Department's cooperative teaching program or both.

101 (I) (II). ELEMENTARY PSYCHOLOGY (D).

An introduction to the basic approaches and concepts of modern psychology. Examples are drawn from the areas of perception, conditioning, cognitive processes, social behavior, tests and

measurements, and personality. Typically oriented discussion sections emphasize the heuristic value of these concepts and approaches in considering some of the problems of our society. 2 class hours, 1 1-hour discussion period.

Credit, 3. Mr. Kamil and Mr. Gadlin.

141 (I) (II). PSYCHOLOGICAL METHODS.

Introduction to the ways questions about behavior are formulated and then tested through experiments. Lectures and laboratory experiences involving concepts from many areas of psychology are used to expose psychology majors to the procedures utilized in designing, conducting, and reporting experiments. Prerequisite, Psychology 101. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Staff.

145 (I) (II). STATISTICS IN PSYCHOLOGY.

Introduction to statistical principles and techniques as applied to psychological data. 3 class hours, 1 1-hour laboratory.

Credit, 3. Staff.

201 (II). PSYCHOLOGY OF ADJUSTMENT (D).

Problems of personality development and adjustment emphasized. Psychological nature of man, conflict, and thinking and adjustment. Prerequisite, Psychology 101. 3 class hours.

Credit, 3. Mr. Kates.

210 (I) (II). SENSATION AND PERCEPTION (D).

Methods, data and theories of the functioning of various sensory systems. Topics will include a survey of basic sensory processes in the cutaneous senses, audition, vision, gustation, and olfaction; and higher perceptual processes in selected senses. Prerequisite, Psychology 101. 3 class hours.

Credit, 3. Mr. Danielson, Mr. Dzendolet.

211 (II). LABORATORY IN SENSATION AND PERCEPTION.

Selected laboratory exercises in audition and vision and a semester project chosen by the student, with the aid of the instructor, in some area of sensation or perception. Prerequisites, Psychology 141 and 210. 2 2-hour laboratory periods.

Credit, 2. Mr. Danielson, Mr. Dzendolet.

220 (I) (II). LEARNING AND THINKING (D).

A general survey of animal and human learning and performance. Topics include: factors affecting acquisition, generalization, discrimination, extinction, and transfer in animals and humans; memory; and higher cognitive processes in humans. Prerequisite, Psychology 101. 3 class hours.

Credit, 3. Staff.

221 (I). LABORATORY IN HUMAN LEARNING.

Introduction to methods used in investigating rote verbal learning, concept formation, short-term retention, verbal conditioning, artificial language learning, motor-skills, and other phenomena in human learning and retention. Prerequisites, Psychology 141 and 220. 2 2-hour laboratory periods.

Credit, 2. Mr. Chumbley, Mr. Clifton.

222 (II). LABORATORY IN ANIMAL LEARNING.

Introduction to methods used in investigating classical conditioning and operant behavior primarily using laboratory animals as subjects. Topics that will be studied in the laboratory will include: Acquisition, generalization, discrimination, extinction, and transfer phenomena. Prerequisites, Psychology 141 and 220. 2 2-hour laboratory periods.

Credit, 2. Mr. Ayers, Mr. Kamil, Mr. Moore.

230 (I) (II). MOTIVATION (D).

Introduction to theories and research on the nature and determinants of motivation. Topics include instinct, behavior energization concepts, biological and acquired bases of emotions and motives, frustration, conflict and stress. Prerequisite, Psychology 101. 3 class hours. Credit, 3. Mr. Trowill.

231 (II). LABORATORY IN MOTIVATION.

Methods of investigating motivation, including both laboratory and field studies using human and animal subjects. Includes selected projects conducted individually and in small groups by members of the class. Prerequisites, Psychology 141, 230. 2 2-hour laboratory periods. Credit, 2. Mr. Trowill.

242 (II). ADVANCED EXPERIMENTAL PSYCHOLOGY.

Literature, techniques, and apparatus of experimental psychology. Selected projects carried out individually by members of the class. Prerequisite, Psychology 141. 1 class hour, 2 2-hour laboratory periods. Credit, 3. Mr. Dzendolet.

245 (I). STATISTICAL INFERENCE IN PSYCHOLOGY.

Application of statistical procedures to analysis of psychological data and to problems of measurement in psychology and related fields. Prerequisites, Psychology 101, Psychology 145, or Statistics 121. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Myers.

250 (I) (II). PHYSIOLOGICAL PSYCHOLOGY.

Neural bases of behavior, current issues in physiological psychology; psychobiological investigations of learning, sensory processes, motivation, and instinctive behavior. Prerequisites, Psychology 101 and Zoology 101 or consent of instructor. 3 class hours. Credit, 3. Mr. Carlson, Mr. Trowill.

251 (I). LABORATORY IN
PHYSIOLOGICAL PSYCHOLOGY.

Development of skills in laboratory techniques used in physiological psychology, including animal neurosurgery, electrophysiological stimulation and recording, and assessment of drug-behavior interactions. Prerequisites, Psychology 141 and 250. 2 2-hour laboratory periods. Credit, 2. Mr. Carlson.

260 (I). CHILD BEHAVIOR AND DEVELOPMENT.

Psychological development of the child, including theories, methods, and data of child behavior studies. Open to Psychology majors only. Prerequisite, Psychology 101. 3 class hours. Credit, 3. Staff.

261 (II). LABORATORY IN CHILD BEHAVIOR
AND DEVELOPMENT.

Selected experiments investigating perceptual, conceptual, learning, and social processes in children. Prerequisite, Psychology 141 and 260. 2 2-hour laboratory periods. Credit, 2. Mrs. Clifton, Mrs. Myers.

262 (I). CHILD PSYCHOLOGY (D).

Psychological development of the child, including language, emotions, intelligence, social behavior, motivation, and personality. Not open to psychology majors. Prerequisite, Psychology 101. 3 class hours. Credit, 3. Staff.

263 (III). PSYCHOLOGY OF ADOLESCENCE (D).

Consideration of the development, and emotional, social and intellectual adjustment of the individual during the adolescent years. Prerequisite, Psychology 101. 3 class hours. Credit, 3. Mr. Schumer, Mr. Willoughby.

265 (I). INTRODUCTION TO THE STUDY OF
EXCEPTIONAL CHILDREN.

Emphasis on the etiology, diagnosis, characteristics, education, and prognosis of deviations in mental, physical, and socio-emotional development. Prerequisites, Psychology 101, 262, or consent of instructor. 3 class hours. Credit, 3. Staff.

270 (I) (II). PERSONALITY (D).

Introduction to the scientific study of personality. A consideration of personality development, structure and dynamics from major theoretical orientations. Prerequisite, Psychology 101. 3 class hours. Credit, 3. Mrs. Appley, Mr. Kates.

271 (III). EXPERIMENTAL STUDY OF PERSONALITY.

Review and evaluation of research approaches to the study of personality. Data, theories, and methods of investigation will be studied. Selected projects will be carried out by class members. Prerequisites, Psychology 141 and 270. 2 2-hour laboratory periods. Credit, 2. Mr. Harmatz.

280 (I). SOCIAL PSYCHOLOGY (D).

Introduction to the principles and study of social behavior. A general consideration of the psychological factors involved in attitude formation and change, communication and persuasion, and small group processes. Prerequisite, Psychology 101. 3 class hours. Credit, 3. Mrs. Eagly, Mr. Berger.

281 (I). LABORATORY IN ATTITUDES AND OPINIONS.

Methods and research concerning attitude formation and change, attitude and opinion measurement, communication and persuasion. Prerequisites, Psychology 141 and 280 or consent of instructor. 2 2-hour laboratory periods. Credit, 2. Mrs. Eagly, Mr. Himmelfarb.

282 (II). LABORATORY IN GROUP BEHAVIOR.

Methods and research concerning the behavior of individuals in groups. Interpersonal attraction, social interaction and influence, power and conflict, communication, group structure, leadership, and productivity. Prerequisites, Psychology 141 and 280, or consent of instructor. 2 2-hour laboratory periods. Credit, 2. Mr. Levinger.

290 (I). INDUSTRIAL PSYCHOLOGY.

Psychological principles, underlying personnel selection and training, communication and decision-making in industry. Prerequisite, Psychology 101. 3 class hours. Credit, 3. Mr. Moss.

301 (I) (II). EDUCATIONAL PSYCHOLOGY.

Psychological facts and principles of development, learning, and measurement as applied to educational situations. Prerequisite, Psychology 101. 2 class hours, 1 2-hour laboratory period. Credit, 3. Mr. Schumer.

305 (II). HISTORICAL AND CONTEMPORARY SYSTEMS (D).

General structure of psychological theory; analysis and comparison of historical systems in the tradition of British empiricism-associationism and Continental rationalism, and of derivative near-contemporary and contemporary mentalistic, functionalistic, and behavioristic systems. Prerequisite, Psychology 101. 3 class hours. Credit, 3. Mr. Ayres, Mr. Feldman.

311 (I). PSYCHOLOGICAL TESTS.

Survey of tests of intelligence, aptitude, interest, personality, and adjustment. Test rationale, construction, characteristics, uses and evaluation emphasized. Prerequisite, Psychology 101. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Mr. Emrick, Mr. Turner.

325 (II). ABNORMAL PSYCHOLOGY (D).

Etiology, symptoms and therapy of behavior abnormalities including neuroses, psychoses, epilepsies, speech disorders, and mental deficiency. Hospital trips and clinics. Prerequisite, Psychology 101. 3 class hours.

Credit, 3. Mr. Harmatz, Mr. Cashdan.

331 (II). CLINICAL PSYCHOLOGY.

Introduction to the theoretical approach and methods used in understanding and treating the psychologically-disturbed individual. Prerequisite, Psychology 325 or permission of instructor. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Mr. Epstein.

365 (II). THEORIES AND PRACTICE IN COUNSELING.

Theories, techniques and tests necessary in counseling and guidance. Practice in organization and evaluating relevant data in the analysis of illustrative cases. Prerequisite, Psychology 270, or 311, or permission of instructor. 2 class hours, 1 2-hour laboratory period.

Credit, 3. Mr. Southworth, Mr. Turner.

385 (I), 386 (II). SPECIAL PROBLEMS.

For qualified seniors. Independent work on special problems or in certain fields of psychological interest. By arrangement with members of the department. Credit, 1-3.

387 (I) (II). READINGS IN PSYCHOLOGY.

Survey of relevant research literature under guidance of a staff member who will direct the student's research problem. Open only to qualified juniors. By arrangement with members of the department. Credit, 1-3.

391 (I) (II). SEMINAR IN PSYCHOLOGY.

For qualified juniors and seniors. A survey and critical evaluation of the literature pertaining to selected topics in Psychology. By permission of the department. Credit, 1-3.

Romance Languages

Head of Department: Professor Robert E. Taylor (French). Associate Head for Spanish: Professor Irving P. Rothberg, Associate Head for French: Professor Micheline Dufau, Associate Head for Classics: Associate Professor Gilbert

Lawall; Associate Head for Italian: Associate Professor Zina Tillona. In charge of Portuguese: Assistant Professor Thomas Sousa.

CLASSICS

Associate Head for Classics: Associate Professor Lawall; Associate Professor Phinney, Jr.; Assistant Professor Goar; Lecturer Donley.

Students majoring in Classics may place emphasis on Greek and/or Latin language and literature, ancient history, ancient art and archaeology, ancient philosophy, ancient religion and mythology, the Classical tradition, or a comparative study of ancient and modern literatures. Two or more of these fields may be combined according to the student's interests.

In addition to the courses listed below, various departments at the University offer courses dealing with specific aspects of classical antiquity. Consult the offerings in the departments of art, history, philosophy, and political science.

Students may also elect courses in any field of ancient studies at the neighboring colleges, Amherst, Mount Holyoke, and Smith, under the Five College Cooperation Program. Information is available from the Department of Romance Languages (Classics) at the University.

LATIN

110 (I). ELEMENTARY LATIN.

An intensive introduction to the Latin language; emphasis on reading skills. 3 class hours, 2 practice sessions. Credit, 4.

140 (I, II). INTERMEDIATE READINGS IN CLASSICAL LATIN (C).

Readings in a variety of Classical Latin authors. Prerequisite, Latin 110 or 2-3 years of high school Latin. 3 class hours, 2 practice sessions. Credit, 4.

141 (II). INTERMEDIATE READINGS IN MEDIEVAL LATIN (C).

Readings in a variety of Medieval Latin authors. Prerequisite: Latin 110 or 2-3 years of high school Latin. 3 class hours, 2 practice sessions. Credit, 4.

161 (I), 162 (II). SURVEY OF CLASSICAL LATIN LITERATURE (C).

Representative selections from Latin literature of the Republic and Empire. Supplementary readings in English. Prerequisite: Latin 140 or 141 or 4 years of high school Latin. 3 class hours. Credit, 3.

307 (I). THE TEACHING OF LATIN IN SECONDARY SCHOOLS.

Examination and evaluation of various methods of teaching Latin in secondary schools, accompanied by actual experience teaching in the classroom and discussion of special problems. 3 class hours. Credit, 3. Miss Donley.

Courses numbered 325–330 will be offered in rotation.

325 (I). THE LATIN POLITICAL TRACT.

Selections from Sallust and Caesar accompanied by an historical and literary analysis of their works. 3 class hours. *Credit, 3.*

326 (II). LATIN DIDACTIC EPIC.

Selections from Lucretius, Vergil's *Georgics*, Ovid's *Ars amatoria* and *Metamorphoses*. 3 class hours. *Credit, 3.*

327 (I). LATIN HISTORY AND BIOGRAPHY.

Selections from Livy, Tacitus, and Suetonius. 3 class hours. *Credit, 3.*

328 (II). LATIN DRAMA.

Selected plays of Plautus, Terence, and Seneca. 3 class hours. *Credit, 3.*

330 (II). LATIN ELEGIAC POETRY.

Selections from Catullus, Tibullus, Propertius, and Ovid. 3 class hours. *Credit, 3.* Mr. Phinney.

385 (I, II). SPECIAL STUDIES.

Directed independent or group study of some problem in Latin language or literature. *Credit, 1–3.* Mr. Goar.

390 (I, II). LATIN SEMINAR.

Advanced study of some aspect of Latin literature. *Credit, 1–6.*

GREEK

110 (I). ELEMENTARY GREEK.

An intensive introduction to the ancient Greek language; emphasis on reading skills. 3 class hours, 2 practice sessions. *Credit, 4.*

140 (II). INTERMEDIATE GREEK READING (C).

Readings in Plato's dialogues. Prerequisite, Greek 110 or 2–3 years of high school Greek. 3 class hours, 2 practice sessions. *Credit, 4.*

161 (I), 162 (II). SURVEY OF GREEK LITERATURE (C).

Representative selections of Greek literature from Homer to Theocritus. Supplementary readings in English. Prerequisite, Greek 140. 3 class hours. *Credit, 3.*

The following courses require no knowledge of Greek or Latin.

225 (I). MYTHOLOGY IN THE ANCIENT WORLD (C).

The structural affinities between Greek myth and earlier or contemporary myth from the ancient Near East; the influence of these traditional modes of mythic thought on the religions, society, and literature of Western civilization. 3 class hours. *Credit, 3.* Mr. Phinney.

265 (I). GREEK DRAMA IN TRANSLATION (C).

Thematic analysis of selected Greek tragedies and comedies; typical characterization, cultural, political, and social values as expressed in the plays. 3 class hours. *Credit, 3.*

FRENCH

Professors Taylor (Head of Department and Professor of French), Dufau (Associate Head and Principal Adviser), R. Johnson, Weiner; Associate Professors Carre, Cassirer,

Mankin, Raymond, Rountree, Smith; Assistant Professors Azibert, Chen, Garaud, Gugli, Guillumette, Hanrez, P. Johnson, S. Lawall, O'Connell; Instructors Harris, Lamb, Lee, Six, Tedeschi; Part-time Lecturers Goberman, Leon de Vivero.

110, 120 (I, II). ELEMENTARY FRENCH.

For those who have no previous creditable training in French. Intensive practice in the four language skills. Sequence: French 110, 120, 130, 140. 3 class hours, 2 laboratory periods. *Credit, 3.*

125 (I). INTENSIVE ELEMENTARY FRENCH.

Same as French 110–120. 5 class hours, 3 laboratory periods. *Credit, 6.*

130 (I) (II). INTERMEDIATE FRENCH: FRENCH LIFE AND CULTURE.

Intensive review and study. Readings in modern French literature. Sequence: French 130, 140. Prerequisite, French 120 or equivalent. 3 class hours. *Credit, 3.*

132 (I). INTERMEDIATE FRENCH: FRENCH LIFE AND CULTURE.

For Honor students and Majors. 3 class hours. *Credit, 3.*

133 (I) (II). INTERMEDIATE FRENCH: FRENCH LIFE AND CULTURE.

Same as French 130 but meeting 4 times per week. For students who need extra help. 4 class hours. *Credit, 3.*

140 (I), (II). INTERMEDIATE FRENCH: FRENCH LIFE AND CULTURE (C).

An introduction to French culture through selections from 20th century literature. The course emphasizes reading and discussion. 3 class hours. *Credit, 3.*

142 (I), (II). INTERMEDIATE FRENCH: FRENCH LIFE AND CULTURE.

For Honor students and Majors. Stresses composition as well as reading and discussion. 3 class hours. *Credit, 3.*

144 (I), (II). INTERMEDIATE FRENCH: FRENCH LIFE AND CULTURE.

Stresses the reading of contemporary fiction. 3 class hours. *Credit, 3.*

145 (II). INTERMEDIATE FRENCH: READINGS IN THE HUMANITIES.

Stresses reading of non-fiction. 3 class hours. *Credit, 3.*

146 (III). INTENSIVE INTERMEDIATE FRENCH.

Same as French 130–140. 6 class hours. *Credit, 6.*

147 (II). INTERMEDIATE FRENCH: READINGS IN THE SOCIAL SCIENCES.

3 class hours. *Credit, 3.*

148 (II). INTERMEDIATE FRENCH: READINGS IN MATHEMATICS AND SCIENCES.

3 class hours. *Credit, 3.*

161 (I), (II). GREAT WORKS IN FRENCH LITERATURE (C).
Selected complete works of several periods in poetry and novel.
Prerequisite for advance courses in French. 3 class hours.
Credit, 3.

162 (I), (II). GREAT WORKS IN FRENCH LITERATURE (C).
Selected complete works of several periods in non-fiction and
the theater. Prerequisite for advance course in French. 3 class
hours.
Credit, 3.

181 (I), (II). ORAL FRENCH, PHONETICS AND PHONEMICS.
Intensive practice of French pronunciation through a knowledge
of its sound system. 3 class hours, 2 laboratory periods.
Credit, 3.

182 (I), (II). ORAL PRACTICE.
For students who have completed French 181 and need practice
in conversational French. 3 class hours.
Credit, 2.

250 (I). FRENCH CIVILIZATION.
French civilization to 1800. Designed for an intelligent under-
standing of French literature and thought through a knowledge
of their background. 3 class hours.
Credit, 3.

251 (II). FRENCH CIVILIZATION.
Designed for an intelligent understanding of contemporary
French literature through a knowledge of its recent background.
Prerequisite, French 250 or History 101-102. 3 class hours.
Credit, 3.

255 (I). FRENCH COMPOSITION.
An advanced composition course required of French majors and
intended especially for them.
Credit, 3.

256 (II). COMPOSITION AND STYLISTICS.
An advanced composition course required of French majors and
intended especially for them.
Credit, 3.

260 (II). ADVANCED LANGUAGE STUDY.
Thorough examination of professional requirements and needs
for the teaching of French in the U.S. 3 class hours.
Credit, 3.

282 (II). ORAL PRACTICE.
For students who have completed French 181-182 and need ad-
ditional practice. (Students who have completed 181 and who
have a strong background in oral production may be excused
from the 182 by permission of the Department.) 3 class hours.
Credit, 2.

290 (I or II). MASTERPIECES IN TRANSLATION (C).
The vision of man in French literature from the Renaissance to
the XXth century. Not open to French majors or to students who
have completed either French 161 or 162. 3 class hours.
Credit, 3.

320 (I). THE FRENCH RENAISSANCE.
Major writers of the sixteenth century with appropriate atten-
tion to important humanistic and artistic developments. 3 class
hours.
Credit, 3. Miss Azibert.

325 (I). FRENCH LITERATURE OF THE SEVENTEENTH CENTURY.
Major works of pre-classicism, classicism, and the transition,
except the theater. Given in alternate years. 3 class hours.
Credit, 3. Mr. Rountree, Mrs. Carré.

330 (II). FRENCH LITERATURE OF THE SEVENTEENTH
CENTURY: THEATER.

French drama in the seventeenth century. Given in alternate
years. 3 class hours.
Credit, 3. Mr. Garaud, Mrs. Carré.

340 (I). FRENCH LITERATURE OF THE EIGHTEENTH CENTURY.
Development of ideas of the French Enlightenment. Given in
alternate years. 3 class hours.
Credit, 3. Mr. Taylor, Mr. Cassirer.

345 (II). THE DRAMA OF THE FRENCH ENLIGHTENMENT.
Readings in French theater from LeSage to Beaumarchais. 3
class hours.
Credit, 3. Mrs. Raymond.

355. THE FRENCH NOVEL OF THE NINETEENTH CENTURY
Development of the novel since the Revolution. 3 class hours.
Credit, 3. Mr. Weiner, Mr. Smith.

356. THE FRENCH THEATER OF THE NINETEENTH CENTURY.
Development of theater from Hugo to Rostand and his con-
temporaries. 3 class hours.
Credit, 3. Mr. Weiner, Mr. Mankin.

357. FRENCH POETRY OF THE EARLY NINETEENTH CENTURY.
Major movements in poetry up to Beaudelaire and the Symbolists.
3 class hours.
Credit, 3. Mr. Gugli, Mrs. Lawall.

360. THE FRENCH THEATER OF THE TWENTIETH CENTURY.
French theater from Scribe to the present. Given in alternate
years. 3 class hours.
Credit, 3. Mr. Mankin, Mr. Weiner.

365. MAJOR FIGURES OF THE CONTEMPORARY FRENCH
NOVEL.
Novels of Romain, Martin du Gard, Duhamel, Gide, Proust,
Montherlant, Giraudoux.
Credit, 3. Mrs. Johnson, Mr. Hanrez.

366. MAJOR FIGURES OF THE CONTEMPORARY FRENCH
NOVEL.
Novels of Malraux, Camus, Sartre, Simone de Beauvoir, Ber-
nanos, Mauriac and Julien Green.
Credit, 3. Mrs. Johnson.

375. CONTEMPORARY FRENCH POETRY.
Nerval, Baudelaire, Mallarmé, Rimbaud, Verlaine, etc.
Credit, 3. Mr. Johnson.

376. CONTEMPORARY FRENCH POETRY.
Valéry, Claudel, Apollinaire, Saint-John Perse, etc.
Credit, 3. Mr. Johnson, Mrs. Lawall.

380. FRENCH-AFRICAN LITERATURE.
Survey of contemporary literature written in French by African
writers, and its literary and ideological background.
Credit, 3. Mr. Cassirer.

381, 382. ADVANCED FRENCH STUDIES.
A special study of a French author or genre under independent
guidance. By permission of the department.
Credit, 1-3. Staff.

390. SENIOR SEMINAR.
French literature for advanced students. Subject of the seminar
is announced the preceding semester.
Credit, 1-3. Staff.

ITALIAN

Associate Head for Italian and Principal Adviser: Associate Professor Tillona. Assistant Professors Bongiorno, Gugli, Sturm; Instructors Pedroni, Terrizzi.

110, 120 (I), (II). ELEMENTARY ITALIAN.

For students with no previous creditable training in Italian. Intensive practice in language skills. 3 class hours, 2 laboratory sessions. *Credit, 3.*

126 (I), (II). INTENSIVE ELEMENTARY ITALIAN.

For motivated students with no previous creditable training in Italian. Intensive training in all language skills. Equivalent of 110, 120. 8 class hours, including lab. *Credit, 6.*

130, 140 (I), (II). INTERMEDIATE ITALIAN (140: C).

For students with one year of college Italian or equivalent. Training in the language skills; emphasis on speaking and understanding; readings in cultural and literary texts. 3 class hours. *Credit, 3.*

146 (I), (II). INTENSIVE INTERMEDIATE ITALIAN (C).

For motivated students with one year of college Italian or equivalent. Reinforcement of basic language skills, further training in all skills. Reading and discussion of literary and cultural texts. 8 class hours, including conversation and drill sessions. *Credit, 6.*

161 (I), 162 (II). INTRODUCTION TO ITALIAN LITERATURE (C).

Close reading of representative works in Italian literature. Training in the techniques of literary analysis of the main literary forms. Prerequisite for advanced courses in Italian. *Credit, 3.*

181 (I), 182 (II). ORAL ITALIAN.

Oral aspect of the language; pronunciation, vocabulary building, speeches, discussions, debates. 3 class hours, laboratory. *Credit, 3.*

290. ITALIAN LITERATURE IN TRANSLATION (C).

Detailed study of representative works of Italian literature from various periods. Not open to students specializing in Italian. 3 class hours. *Credit, 3.*

301 (I), 302 (II). DANTE AND THE DUECENTO.

Selections from the works of Dante and his contemporaries; intensive study of the Divine Comedy. 3 class hours. *Credit, 3. Mrs. Sturm.*

310. PRE-HUMANISM AND THE EARLY RENAISSANCE.

Literature of the 14th and early 15th centuries: Petrarca, Boccaccio, Poliziano, Alberti, Sacchetti. 3 class hours. *Credit, 3.*

315. THE HIGH RENAISSANCE.

Literature of the late 15th and 16th centuries: Machiavelli, Castiglione, Ariosto, Tasso. 3 class hours. *Credit, 3. Mr. Bongiorno.*

330. ITALIAN LITERATURE OF THE EIGHTEENTH CENTURY.

Significant currents and authors from Goldoni to Alfieri. 3 class hours. *Credit, 3.*

390 (I or II). SEMINAR IN ITALIAN LITERATURE.

Italian literature for advanced students. Subject of the seminar announced the preceding semester. 3 class hours. *Credit, 3.*

SPANISH AND PORTUGUESE

Associate Head for Spanish and Portuguese: Professor Irving P. Rothberg. Professors Boudreau, Greenfield, Piccus, Wexler; Associate Professors Bancroft, De Puy; Assistant Professors Barreda-Tomás, Fernández-Turiénzo, Humphrey, Scott, Sturm; Instructors Bradford, Galvin, MacLeod, Meisner, Pollock.

PORTUGUESE

At present no major in Portuguese exists. Students wishing to do further work in this field may take approved courses at Smith College.

110 (I), 120 (II). ELEMENTARY PORTUGUESE.

For students with no previous creditable training in Portuguese. Intensive practice in the language skills. 3 class hours, laboratory. *Credit, 3.*

130 (I), 140 (II). INTERMEDIATE PORTUGUESE.

For students with one year of college Portuguese or equivalent. Training in the language skills; emphasis on speaking and understanding; readings in cultural and literary texts. 3 class hours. *Credit, 3.*

161 (I), 162 (II). INTRODUCTION TO PORTUGUESE LITERATURE.

Selected masterpieces of Portuguese literature presented integrally, in literary-historical perspective. Conducted in Portuguese. Either semester may be elected independently. Prerequisite, Portuguese 140 or permission of the department. 3 class hours. *Credit, 3.*

SPANISH

110, 120 (I), (II). ELEMENTARY SPANISH.

For students with no previous creditable training in Spanish. Intensive practice in language skills. To fulfill the language requirement, upon completion of the course most students are required to continue by taking Spanish 130 or 140. 3 class hours, 2 laboratory sessions. *Credit, 3.*

126 (1), (II). ELEMENTARY SPANISH—INTENSIVE.

An intensive elementary course with emphasis on the oral aspect designed to allow completion of Spanish 110 and 120 in one semester. 10 class hours. Open to all students. *Credit, 6. Mrs. MacLeod, Mrs. Meisner.*

130, 140 (I), (II). INTERMEDIATE SPANISH (140: C).

For upperclassmen who have completed Spanish 110–120, and those freshmen and transfer students who are found qualified by placement examination. Training in language skill, with emphasis on speaking and understanding; readings in cultural and literary texts. Students completing Spanish 140 fulfill the language requirement. 3 class hours. *Credit, 3.*

131 (I), 141 (II). GRAMMAR.

A review of basic elements of grammar. For Spanish majors and others who plan to continue with Spanish beyond Spanish 140. To be taken concurrently with Spanish 130 and 140. 2 class hours. *Credit, 1. Mrs. Galvin.*

132 (I), 142 (II). INTERMEDIATE SPANISH.

(Honors Sections) (142: C).
See Spanish 130, 140 for description. 3 class hours. *Credit, 3.*

133 (I). INTERMEDIATE SPANISH (Remedial).

See Spanish 130 for description. For students who are not fully qualified for placement in Spanish 130. 4 class hours. *Credit, 3.*

146 (I), (II). INTERMEDIATE SPANISH—INTENSIVE.

An intensive intermediate course. Emphasis on conversation in Spanish and readings in Hispanic literature. Systematic review of grammar. Successful completion of this course satisfies the foreign language qualification. 8 class hours.

Credit, 6. Mrs. Bradford, Mrs. MacLeod.

161 (I). INTRODUCTION TO SPANISH LITERATURE (C).

Selected complete works in several genres studied analytically and critically to develop intensive reading skills and extend the student's ability to interpret and explicate in Spanish both orally and in writing. Prerequisite, Spanish 140 or equivalent. 3 class hours. *Credit, 3.*

181 (I), 182 (II). ORAL SPANISH.

Oral aspects of the language: pronunciation, vocabulary building, speeches, discussions, debates. Grammatical elements required for correct and fluent use of American and Peninsular Spanish. Prerequisite, Spanish 140 or permission of the department. 4 class hours. *Credit, 3. Mr. Wexler and Staff.*

251 (I). CONVERSATIONAL SPANISH. (Course 1)

For Spanish majors and others interested in developing fluency in the spoken language. Prerequisite, Spanish 181–182 or permission of the department. *Credit, 1. Mrs. Galvin.*

252 (II). CONVERSATIONAL SPANISH. (Course 2)

For Spanish majors and others interested in further developing fluency in the spoken language. Prerequisites, Spanish 181–182 and Spanish 251 or permission of the department.

Credit, 1. Mrs. Galvin.

253 (I). CONVERSATIONAL SPANISH. (Course 3)

For Spanish majors and others interested in further developing fluency in the spoken language. Prerequisites, Spanish 181–182 and Spanish 251 and 252 or permission of the department.

Credit, 1. Mrs. Galvin.

262 (II). RECURRENT THEMES IN SPANISH LITERATURE (C).

Selected complete works in various periods read critically and historically to develop salient characteristics of a given problem, theme or figure as reflected in work of different authors, genres, movements, and centuries. Emphasis on training the student for independent work through writing of research reports and final paper. Prerequisite, Spanish 161. 3 class hours.

Credit, 3. Miss De Puy.

290 (II). SPANISH MASTERPIECES IN TRANSLATION (C).

Detailed study of masterpieces of Spanish literature from various periods. Not open to majors in Spanish nor to students who have taken or plan to take Spanish 161–162. 3 class hours.

Credit, 3.

310 (I). ADVANCED COMPOSITION AND STYLISTICS.

Intensive study of composition and stylistics. Open to Spanish majors and other qualified students by permission of the department. 3 class hours.

Credit, 3.

315 (I). SPANISH LITERATURE TO 1700.

Spanish literature in the Middle Ages and Renaissance; introduction to the High Golden Age. Required of all undergraduate Spanish majors prior to the senior year. Prerequisite, Spanish 262. 3 class hours.

Credit, 3. Mr. Piccus.

325. PROSE OF THE GOLDEN AGE.

Major prose works in 16th and 17th century Spain with emphasis on the novel, excluding the *Quijote*. 3 class hours.

Credit, 3. Mr. Rothberg.

330. CERVANTES.

Intensive reading of *Don Quijote*. 3 class hours.

Credit, 3. Mr. Wexler.

335. LYRIC POETRY OF THE GOLDEN AGE.

Spanish poetry of the 16th and 17th centuries from Garcilaso to Gongora. 3 class hours.

Credit, 3. Mr. Rothberg.

340. DRAMA OF THE GOLDEN AGE.

Deals primarily with the comedia during the period of maximum creation, 1556–1681. 3 class hours.

Credit, 3. Mr. Wexler.

355. SPANISH LITERATURE FROM 1700
THROUGH ROMANTICISM.

Spanish literature and thought in the eighteenth century and the Romantic movement. 3 class hours.

Credit, 3. Mr. Greenfield.

365. THE SPANISH NOVEL AND DRAMA IN
THE LATE NINETEENTH CENTURY.

Post-Romantic literature of Spain in the nineteenth century with emphasis on prose fiction. 3 class hours.

Credit, 3. Mr. Boudreau.

370. SPANISH-AMERICAN LITERATURE TO 1900.

A survey from pre-Columbian times to the Modernist movement. 3 class hours.

Credit, 3. Mr. Barrera-Tomás.

372. MAJOR SPANISH-AMERICAN WRITERS.

Intensive study of major figures in Spanish-American literature: Sarmiento, Dario, Rodo, Reyes and others. 3 class hours.

Credit, 3.

357. NARRATIVE PROSE IN MODERN SPANISH AMERICA.

Spanish-American prose fiction in the late nineteenth and twentieth centuries. 3 class hours.

Credit, 3. Mr. Bancroft.

381. DRAMA AND POETRY IN TWENTIETH-
CENTURY SPAIN.

Spanish poetry and the theater from the Generation of '98 to the present. 3 class hours.

Credit, 3. Mr. Greenfield.

382. SPANISH PROSE IN THE TWENTIETH CENTURY.

The novel and essay since 1898. 3 class hours.

Credit, 3. Mr. Boudreau.

390. SENIOR SEMINAR.

Independent work on special problems in Hispanic literatures.

Credit, 3.

Slavic Languages and Literatures

Head of Department: Associate Professor Maurice J. Levin. Professor Ivask; Associate Professors Pressman and Tikos; Assistant Professor Lake; Instructor Stawiecki; Lecturer Kosinski.

RUSSIAN

110 (I), 120 (II). ELEMENTARY RUSSIAN.

Grammar, exercises in composition and conversation, selected readings. No previous language training required. 3 class hours, 1 laboratory hour. *Credit, 3.*

119 (I), 129 (II). RUSSIAN READING COURSE.

Intensive study of Russian grammar. Emphasis on developing reading ability only. No previous language training required. 5 class hours. *Credit, 5.*

130 (I), 140 (II). INTERMEDIATE RUSSIAN. (C).

Review of fundamentals of grammar followed by more advanced study of grammatical structure and idiom. Composition, conversation and readings in Russian fiction. Prerequisite, Russian 120 or equivalent. 3 class hours. *Credit, 3.*

201 (I). RUSSIAN CULTURE (C).

Brings into focus the facts pertaining to Russian geographical, historical, literary, religious, philosophic and artistic life in order to assess properly Russian cultural progress. Conducted in English. No language prerequisite. 3 class hours. *Credit, 3.*

251 (I), 252 (II). INTRODUCTION TO RUSSIAN LITERATURE (C).

Survey course conducted in Russian. Readings in Russian and English, written reports. Prerequisite, Russian 262 or equivalent. Departmental requirement for Russian majors. 3 class hours. *Credit, 3.*

253. (I). DOSTOEVSKY (C).

Historical and literary background. Close text analysis. Student reports. Readings of selected works in the original required of Russian majors. Prerequisite, junior standing. 3 class hours. *Credit, 3.*

254 (II). TOLSTOY (C).

Historical and literary background. Close text analysis. Student reports. Readings of selected works in the original required of Russian majors. Prerequisite, junior standing. 3 class hours. *Credit, 3.*

255 (I). MASTERPIECES OF RUSSIAN LITERATURE IN TRANSLATION.

Selection from classics of Russian romanticism and realism culminating in the novels of Dostoevsky and Tolstoy. Prerequisite, junior standing. 3 class hours. *Credit, 3.*

256 (II). RUSSIAN DRAMA.

Russian drama in the originals from the beginnings to the establishment of a national repertoire and theatre. Plays from Fonvizin to Gorky. Prerequisite, Russian 262 or equivalent. 3 class hours. *Credit, 3.*

257 (II). SOVIET LITERATURE.

Beginnings and development of Soviet prose, drama and criticism from Gorky to the present. Conducted in English. Majors are required to do research in Russian. Prerequisite, junior standing. 3 class hours. *Credit, 3.*

258 (II). RUSSIAN POETRY.

Russian poetry in the originals. Nineteenth century to the present. Prerequisite, Russian 262 or equivalent. 3 class hours. *Credit, 3.*

261 (I), 262 (II). ADVANCED RUSSIAN.

Advanced grammar, building vocabulary and improving reading ability through selections from the Classical and Soviet Periods. Composition and classroom discussions in Russian on reading material. Prerequisite, Russian 140 or equivalent. Departmental requirement for Russian majors. 3 class hours. *Credit, 3.*

263 (II). HISTORY OF THE RUSSIAN LANGUAGE.

Historical phonology and morphology of Russian with special emphasis on the development of the Russian literary language. Prerequisite, Russian 281 or equivalent, and senior standing. 3 class hours. *Credit, 3.*

264 (II). SCIENTIFIC RUSSIAN.

Intensive experience in translating scientific, technical, academic and journalistic articles. Prerequisite, Russian 140 or equivalent. 3 class hours. *Credit, 3.*

265. (I). STRUCTURE OF RUSSIAN.

Descriptive analysis of the morphology of contemporary standard Russian with additional emphasis on selected problems of derivation. Prerequisite, Russian 262 or equivalent. 3 class hours. *Credit, 3.*

266 (II). RUSSIAN PHONETICS.

Detailed analysis of the Russian sound system. Articulation and intonation treated largely in comparison with the sound system of English. Recommended for those preparing to teach Russian. Prerequisite, Russian 262 or equivalent. 3 class hours. *Credit, 3.*

271 (I), 272 (II). RUSSIAN CONVERSATION.

Devoted to acquiring a conversational vocabulary and to developing fluency in speaking Russian. Prerequisite, Russian 140 or equivalent. Departmental requirement for Russian majors. 3 class hours. *Credit, 3.*

281 (I), 282 (II). RUSSIAN STYLISTICS.

A systematic study of the style of Russian literary works. Practical application of grammatical principles and intensive study of idiomatic expressions. Prerequisite, Russian 262 or equivalent. Departmental requirement for Russian majors. 3 class hours. *Credit, 3.*

319 (I). PUSHKIN.

The most important works of Pushkin, prose and poetry: *Eugene Onegin*, *Boris Godunov*, *The Captain's Daughter*, *The Bronze Horseman*, *Poltava*, and others. Facility in speaking and writing Russian required. Class conducted on a seminar basis with each student actively participating. 3 class hours. Credit, 3.

320 (II). GOGOL.

The most important works of Gogol: *The Inspector-General*, *Dead Souls*, *The Overcoat* and selected passages from his *Correspondence with Friends*, and other works. Facility in speaking and writing Russian required. Class conducted on a seminar basis with each student actively participating. 3 class hours. Credit, 3.

331 (I). NINETEENTH CENTURY RUSSIAN CRITICISM.

Criticism of the 19th Century: Belinsky, Chernyshevsky, Dobrolybov, Pisarev and others. Facility in speaking and writing Russian required. Class conducted on a seminar basis with each student actively participating. 3 class hours. Credit, 3.

385 (I), 386 (II). PROBLEMS IN RUSSIAN LANGUAGE AND LITERATURE.

Intensive independent work on special problems. Results to be presented in written form. Prerequisite, Russian 262, and senior standing. Credit, 1-3.

POLISH

110 (I), 120 (II). ELEMENTARY POLISH.

Oral and written exercises, pronunciation and grammar, reading of selected works. No previous language training required. 3 class hours, 1 laboratory hour. Credit, 3.

130 (I), 140 (II). INTERMEDIATE POLISH (140: C).

Review of grammar, composition and selected readings. Prerequisite, Polish 120 or equivalent and permission of instructor. 3 class hours. Credit, 3.

Sociology

Head of Department: Professor Thomas O. Wilkinson. Professors Driver, Gordon, Killian, Lee, Korson, Page, Speier; Associate Professors Hollander, Lewis, Manfredi, Mehta, Park, Piedmont, Platt, Simpson, Sutton, Tausky, Wilson, Yaukey; Assistant Professors Chevan, Golden, O'Rourke; Instructor Barber.

101. INTRODUCTION TO SOCIOLOGY (D).

The fundamental terminology of sociology and intensive discussion of selected topics from a sociological point of view. 2 lectures and 1 discussion section. Credit, 3.

231. SOCIOLOGY OF AGING.

Aging as a social phenomenon in the United States and Massachusetts with special emphasis on the elderly population. Topics include biological, psychological and social factors in the aging

process, the demographic and ecological conditions of aging, the problem of retirement, and public policy and politics as they relate to old age. Prerequisite, Sociology 101. 3 class hours. Credit, 3.

251. URBAN SOCIOLOGY (D).

A comparative analysis of cities and of urbanization with special reference to demographic characteristics or urban populations, urban ecology, and urban social structure. Prerequisite, Sociology 101. 3 class hours. Credit, 3.

254. INDUSTRIAL SOCIOLOGY.

The role, status, and function of the worker in the industrial community. A consideration of changing technology and the adjustment made in the industrial community. Prerequisite, Sociology 101. 3 class hours. Credit, 3.

255. SOCIOLOGY OF RELIGION.

The relationship of religious beliefs and institutions to cultures and societies. Prerequisite, Sociology 101. 3 class hours. Credit, 3.

256. RACE RELATIONS (D).

The social, economic and political aspects of racial and ethnic problems in the United States, plus briefer consideration of similar problems in Africa and Asia. Prerequisite, Sociology 101. 3 class hours. Credit, 3.

257. THE FAMILY (D).

The development of the customs of courtship and marriage and the contemporary American family. The basic causes of changes and trends of the family. Prerequisite, Sociology 101. 3 class hours. Credit, 3.

258. SOCIAL INTERACTION.

Social interaction in the context of groups, especially small groups. Focuses upon the dynamics of interaction process as the basis for group development with special attention to the emergence of normative and affective subsystems and to role differentiation. Prerequisite, Sociology 101. 3 class hours. Credit, 3.

259. SOCIAL STRATIFICATION (D).

The factors associated with institutionalized inequality in social life. A consideration of class, status, and power in American society. Prerequisite, Sociology 101. 3 class hours. Credit, 3.

261. POPULATION PROBLEMS (D).

An analytical study of population composition, focusing upon the causes and consequences of changes in the basic demographic variables: fertility, mortality, and migration. Prerequisite, Sociology 101. 3 class hours. Credit, 3.

265. POPULATION OF JAPAN.

A demographic survey of the history and development of modern Japan. Special emphasis is placed upon (1) the similarities and contrasts between Japan's demographic transition and that of the West, and (2) the relevance of Japanese experience for contemporary underdeveloped nations. Prerequisite, Sociology 261 or equivalent. 3 class hours. Credit, 3.

270. SOCIAL STRUCTURE OF INDIA (D).

The origins, distributions, and cultural traits of the major groups in India. Special attention given to marriage, family, caste patterns, and positions in the economic and political system. Prerequisite, Sociology 101. 3 class hours. *Credit, 3.*

272. SOCIAL CHANGE (D).

A consideration of changes arising from culture contact, social reform, and technical inventions. Planned and unplanned change, particularly with respect to underdeveloped countries. Prerequisite, Sociology 101. 3 class hours. *Credit, 3.*

275. SOCIAL PROBLEMS (D).

The distribution and interrelationships among some types of deviance and disorganization; crime, mental disorders, addiction, suicide, family tension. Theories of causation; research projects. Prerequisite, Sociology 101. 3 class hours. *Credit, 3.*

278. CRIMINOLOGY (D).

The nature of crimes and the factors underlying criminal behavior. The machinery of justice; the law, courts, police systems, and correctional institutions. Prerequisite, Sociology 101. 3 class hours. *Credit, 3.*

280. SOVIET SOCIETY.

Survey of the major social institutions, process and problems of Soviet Society with special reference to official and popular values and norms, stratifications, social controls, the family, types of socialization and social problems (i.e., crime, delinquency, the misuse of leisure, rural migration, etc.). Also examines the nature and usefulness of various theoretical models of Soviet Society. 3 class hours. Prerequisite, Sociology, 101. *Credit, 3.*

282. SOCIOLOGICAL THEORY (D).

Contributions of European and American writers who have concerned themselves with theories of the origin, growth, and development of human social organization. Prerequisite, Sociology 101. 3 class hours. *Credit, 3.*

285. COMPLEX ORGANIZATIONS.

An analysis of the processes leading to the formation, stability and instability of complex organization. Theoretical and empirical work related to these processes will be examined. Prerequisite, Sociology 101. 3 class hours. *Credit, 3.*

286. SOCIOLOGY OF MEDICINE (D).

Survey of the field of medical sociology, and examination of the medical institution using sociological concepts. Organization and utilization of medical care, social epidemiology, interaction between the community and the medical institution, patient-practitioner interaction. Prerequisite, Sociology 101. 3 class hours. *Credit, 3.*

287. SOCIOLOGY OF MENTAL DISORDERS.

Influence of social factors on diagnosis, treatment, and possible etiology of mental disorders. Application of sociological concepts and methods in considering: nature and extent of mental disorders, epidemiology, resources for dealing with mental illness, mental hospitals, and the community in rehabilitation. Prerequisite, Sociology 101. 3 class hours. *Credit, 3.*

292. INTRODUCTION TO SOCIAL WELFARE (D).

The relationship between the American (primarily) social welfare institution and the social and cultural factors influencing its development, interaction with the community, and internal organization. Prerequisite, Sociology 101. 3 class hours. *Credit, 3.*

295. RESEARCH METHODS.

Research methods and techniques employed in sociology. Each student is required to design a research project of limited scope. Prerequisite, Sociology 101. 3 class hours. *Credit, 3.*

296. SEMINAR IN RESEARCH.

Guided research on problems of sociological interest. Students conduct research projects to acquaint them with the tools and logic of sociological research. Prerequisite, Sociology 295. 3 class hours. *Credit, 3.*

375. SOCIOLOGY OF LITERATURE (SEMINAR).

Literature as a source of information about society, in particular social values and norms, social change and conflict and the various relationships between society and the individual. The seminar also examines the conditions under which literature reflects or distorts social realities and the interaction between literary products and their social environment. Prerequisite, Sociology 101. 3 class hours. *Credit, 3.*

385, 386. SPECIAL PROBLEMS IN SOCIOLOGY.

Special topics in sociology designed for individual student's interest. Prerequisite, Sociology 101. 3 class hours. *Credit, 3.*

390, 391. SEMINAR IN SOCIOLOGY.

A survey and critical evaluation of the literature pertaining to selected topics in sociology, for selected juniors and seniors. 3 class hours. *Credit, 3.*

Speech

Head of Department: Professor Ronald F. Reid. Professors Cohen, Lynch, Niedeck, Nober, Wallace. Associate Professors Bevilacqua, Blankenship, Hegarty, Savereid, Stelzner. Assistant Professors Abramson, Bednerik, Bohn, Brann, Harper, Mahnken, Matlon, Nerbonne, Nielsen, Peirce, W. Price, Stewart, Tokay, Weaver, Weiss, Young. Instructors Aldrich, DeLuca, Donohue, Heron, Hopkins, Kaplan, Mihevc, R. Price, Stromgren, Zimmerman. Visiting Professor Volbach.

GENERAL

150. PROCESS OF SPEECH COMMUNICATION.

A survey of theories of the communication process as they relate to the following areas of speech: communication disorders, mass communications (radio-television-film), rhetoric and public address, speech science, and theatre. 3 class hours. *Credit, 3.*

250. SPEECH AND LANGUAGE THEORY.

The nature of speech and language and the process involved in acquiring, understanding and producing speech and language. Prerequisite, Speech 150. 3 class hours. *Credit, 3.*

350. INTRODUCTION TO SPEECH RESEARCH.

An introduction to research methods, bibliographical resources, and professional writing in the field of Speech. Prerequisite, 12 undergraduate credits in Speech. 2 class hours. *Credit, 2.*

COMMUNICATION DISORDERS

181. PHONETICS.

A study of the physiological and acoustic processes involved in producing sounds and the use of the International Phonetic Alphabet in describing these processes. 3 class hours. *Credit, 3.*

182. INTRODUCTION TO COMMUNICATION DISORDERS.

A study of the types and causes of communication disorders with special emphasis on speech disorders. 3 class hours. *Credit, 3.*

283. VOICE AND ARTICULATION DISORDERS.

Study of basic principles and methods involved in the rehabilitation of voice and articulation disorders. Emphasis is given to types of defects, diagnosis and evaluation of defects, and therapeutic procedures. Laboratory observation of voice and articulation therapy. Prerequisites, Speech 181, 182. 3 class hours, 1 1-hour laboratory. *Credit, 3.*

284. ANATOMY AND PHYSIOLOGY OF THE SPEECH AND HEARING MECHANISM.

A study of the anatomy and physiology of the speech and hearing mechanism; consideration of respiration, phonation, resonance, articulation, and audition. 3 class hours. *Credit, 3.*

285. AUDIOLOGY.

Physics of sound; physiology and neurology of hearing. Symptoms and causes of hearing loss; special attention to selected diagnostic testing procedures. Supervised practice in audiometric testing. Prerequisite, Speech 182. 3 class hours. *Credit, 3.*

286. REHABILITATION OF THE ACOUSTICALLY HANDICAPPED.

Techniques of speech therapy, auditory-training, and speech reading for hard of hearing children and adults; multi-sensory approach to language development. Laboratory practice under supervision. Prerequisite, Speech 285. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

287. HEARING AND SPEECH SCIENCE.

Investigation of fundamental physical characteristics of acoustic stimuli as they relate to hearing and speech processes. Laboratory exercises in the use of instrumentation applicable to the analysis of speech stimuli. Prerequisites, Speech 181 and 182. 2 class hours, 1 2-hour laboratory. *Credit, 3.*

288. CLINICAL PRACTICE.

Supervised experience in therapy with individuals having speech and hearing disorders. May be repeated once. Prerequisite, permission of instructor. *Credit, 1-3 per semester.*

289. SPEECH AND LANGUAGE DISORDERS.

Etiologies and rehabilitation of psychological and neurological speech and language disorders. Prerequisite, Speech 250, 3 class hours. *Credit, 3.*

290. STUTTERING.

Major theories of the etiology, diagnosis, and clinical management of stuttering. Prerequisite, Speech 289. 3 class hours. *Credit, 3.*

291. AUDITORY DISORDERS IN CHILDREN.

Audiometric evaluation and procedures applied to the diagnosis of auditory impairments in children from infancy through elementary school. Language development of the pre-school deaf child. Techniques of parent counseling. Prerequisites, Speech 285 and 286. 3 class hours. *Credit, 3.*

390. SEMINAR IN SPEECH PATHOLOGY.

Individual student reports on selected topics. Prerequisite, Speech 182. 3 class hours, 1 3-hour laboratory period. *Credit, 3.*

MASS COMMUNICATIONS

121. INTRODUCTION TO BROADCASTING.

The field of radio and television broadcasting, including its history, present structure, philosophy, and social impact in the United States and abroad. 3 class hours. *Credit, 3.*

222. RADIO PRODUCTION.

A laboratory course emphasizing practical experience in all aspects of radio production, including basic formats of radio programs. 2 class hours, 1 2-hour laboratory period. *Credit, 3.*

223. TELEVISION PRODUCTION-DIRECTION.

A laboratory course emphasizing TV studio procedure and technique. Practical experience is provided in studio crew assignments. 2 class hours. 1 2-hour laboratory period. *Credit, 3.*

224. ADVANCED TELEVISION PRODUCTION-DIRECTION.

An advanced laboratory course which builds on basic skills and techniques developed in the basic production course. Prerequisite, Speech 223. 2 class hours, 1 2-hour laboratory period. *Credit, 3.*

225. HISTORY OF FILM.

Evolution of the motion picture, its high points of artistic growth in representative countries. 3 class hours. *Credit, 3.*

226. FILM PRODUCTION.

Procedures and techniques in all phases of film-making and practical experience in scripting, shooting, and editing of narrative and non-narrative forms. 1 1-hour lecture, 1 4-hour laboratory period per week. *Credit, 3.*

227. FILM THEORY AND CRITICISM.

The various modes and structures of film communication and the basis for evaluating films according to their communicative and aesthetic values. Prerequisite, Speech 225. 3 class hours. *Credit, 3.*

228. RADIO, TELEVISION, FILM AND SOCIETY.

The affective and reflective roles of the radio, television, and film media in society. Prerequisite, Speech 121. 3 class hours. *Credit, 3.*

229. BROADCAST NEWS AND PUBLIC AFFAIRS.

The legal, ethical, and practical problems involved in gathering, preparing, and presenting news broadcasts, news documentaries, and other public service programs. Prerequisites, Speech 121 and 222 or 223. 3 class hours, field trips. *Credit, 3.*

230. RADIO-TELEVISION PROGRAM PLANNING AND SCRIPTWRITING.

Programming theories, program formats, audience determinants of programming, and production requirements. Writing of various types of radio and television programs. Prerequisites, Speech 121 and 222 or 223. 2 class hours, 1 2-hour laboratory per week. *Credit, 3.*

231. PRACTICUM IN BROADCASTING.

Supervised practical experience in all phases of broadcasting, including production, direction, studio operations, and writing. The facilities of WFRC will be utilized. Prerequisites, Speech 121 and 222. 5 laboratory hours per week. This course may be repeated up to a total of 3 credits. *Credit, 1.*

361. SEMINAR IN MASS COMMUNICATIONS.

Individual and group research, analysis, examination, and discussion of major problems in mass communications. Prerequisites, 9 hours of courses in mass communication. This course may be repeated up to a total of 6 credits. *Credit, 3.*

RHETORIC AND PUBLIC ADDRESS

101. ORAL COMMUNICATION.

An introductory study of rhetorical principles with application to the composition and delivery of public speeches. 2 class hours. *Credit, 2.*

105. INTRODUCTION TO RHETORICAL THEORY.

Survey of major concepts of rhetoric in historical perspective from classical Greece to the present. 3 class hours. *Credit, 3.*

107. MASTERPIECES OF PUBLIC ADDRESS.

Notable speeches from ancient to modern times as examples of rhetorical art in historical contexts. 3 class hours. *Credit, 3.*

201. PUBLIC SPEAKING.

Study and application of principles governing the composition and delivery of public speeches. Prerequisite, completion of the University speech requirement. 3 class hours. *Credit, 3.*

202. DISCUSSION.

The principles of group discussion and their application to major contemporary problems. 3 class hours. *Credit, 3.*

203. ARGUMENTATION AND DEBATE.

Study and application of reasoning and evidence as it is used in public deliberation. 3 class hours. *Credit, 3.*

204. PERSUASION.

The theory of persuasion and its application to the composition and delivery of persuasive speeches. 3 class hours. *Credit, 3.*

205. CLASSICAL RHETORICAL THEORY.

Major rhetorical theories from the emergence in ancient Greece to the late Roman Empire. Special emphasis is given to the Sophists, Plato, Aristotle, Hermagoras, Cicero, Quintilian, and St. Augustine. Prerequisite, Speech 105 or permission of the instructor. 3 class hours. *Credit, 3.*

206. EARLY MODERN RHETORICAL THEORY.

The impact of contemporaneous science, philosophy, and aesthetics on rhetorical theory from 1600 to 1900. Special emphasis is given to the eighteenth century Rhetorical Renaissance. Prerequisite, Speech 105 or Speech 205 or permission of the instructor. 3 class hours. *Credit, 3.*

207. AMERICAN PUBLIC ADDRESS.

Reading and analysis of selected American speeches which have been influential in shaping our culture and history by reconstructing the circumstances under which they were given and by exploring the speaker's means of persuasion. 3 class hours. *Credit, 3.*

208. ADVANCED RHETORICAL COMPOSITION.

Intensive study of rhetorical invention, disposition, and style. Practice in the application of principles studied in classical and modern treatises by the preparation and revision of outlines and manuscripts for speeches. Prerequisite, permission of instructor. 3 class hours. *Credit, 3.*

209. BRITISH PUBLIC ADDRESS.

British speakers and speeches with special emphasis given to the reciprocal influence of rhetoric and the development of British culture, society and institutions. 3 class hours. *Credit, 3.*

210. MEDIEVAL AND RENAISSANCE RHETORICAL THEORY.

The developments in rhetorical theory from the beginning of the Middle Ages through the sixteenth century. Prerequisite, Speech 105 or 205 or permission of the instructor. 3 class hours. *Credit, 3.*

211. CONTEMPORARY RHETORICAL THEORY.

Contemporary approaches to rhetorical theory and communication behavior. Special attention is given to the experimental, analytical, critical, and philosophical methods. Prerequisite, Speech 105 or Speech 205 or permission of the instructor. 3 class hours. *Credit, 3.*

212. PARLIAMENTARY PROCEDURE.

The basic principles upon which a group operates, using parliamentary law and practical drill as the class organizes itself into an operating parliamentary body. 2 class hours. *Credit, 2.*

THEATRE AND ORAL INTERPRETATION

115. INTRODUCTION TO THE THEATRE.

Introduction to the art of the theatre: a survey of its aesthetics, elements, forms, and contributing artists; its influences and place in our culture. 3 class hours. *Credit, 3.*

135. FUNDAMENTALS OF PLAY PRODUCTION.
Methodology and techniques of play production; lectures, demonstrations, and practical laboratory work. The responsibilities and contributions of all participating artists are examined in detail through intensive study of every aspect of production from script to stage. 2 class hours; 1 2-hour laboratory period.

Credit, 3.

140. INTRODUCTION TO STAGECRAFT AND DESIGN.
A survey of the nature and function of spectacle in the theatre. Attention will be given to scenery, lighting, costume, and make-up. 3 class hours, 1 hour laboratory period. *Credit, 3.*

152. ORAL INTERPRETATION.
Principles and techniques of reading aloud, using a variety of literary forms: verse, prose, and dialogue. Consideration of specific vocal needs relevant to the communication of meaning. 3 class hours. *Credit, 3.*

240. TECHNICAL PRODUCTION.
The materials and methods in construction for the stage. Prerequisites, Speech 115 and 140. 3 class hours, 1 2-hour laboratory period. *Credit, 3.*

241. PRINCIPLES OF SCENE DESIGN.
An intensive study of the principles of scene design and the application of these principles to a series of design projects. Practical experience will be gained through laboratory work in scene painting and decoration. Prerequisites, Speech 115, 140. 3 class hours, 1 2-hour laboratory period. *Credit, 3.*

242. DESIGN AND CONSTRUCTION OF COSTUME.
Silhouette, draping, color, texture, drafting of patterns, construction, and the application of these basic principles to a series of design projects. Prerequisites, Speech 115, 140. 3 class hours, 1 2-hour laboratory period. *Credit, 3.*

243. ACTING I.
An orientation to the basic physiological and mental tools of the actor. Prerequisite, Speech 115. 2 class hours, 1 2-hour laboratory period. *Credit, 3.*

244. ACTING II.
Character analysis and development with attention given to the interrelationship of characters. Prerequisites, Speech 115, 243. 2 class hours, 1 2-hour laboratory period. *Credit, 3.*

245. DIRECTING I.
An introduction to the theory and practice of stage direction. Emphasis will be placed upon comprehension and mastery of the basic theatrical elements necessary to the creation of the stage picture. Prerequisite, Speech 115. 2 class hours, 3 laboratory hours. *Credit, 3.*

246. DIRECTING II.
Problems in the interpretation and staging of various types of contemporary drama will be explored. Attention will be given to rehearsal and performance procedures. Prerequisite, Speech 245. 2 class hours, 3 laboratory hours. *Credit, 3.*

247. THEATRE HISTORY I (C).
The history of theatre in western civilization from its beginnings to 1642; an investigation of the Classical, Medieval, and Renaissance theatres with emphasis on the origins and development of drama, spectacle, theatre production, and theatre architecture. 3 class hours. *Credit, 3.*

248. THEATRE HISTORY II (C).
History of the theatre in western civilization with emphasis on the 18th and 19th centuries, the Continental, English, American, and Modern Theatres. 3 class hours. *Credit, 3.*

251. ORAL INTERPRETATION OF CHILDREN'S LITERATURE.
Selection and interpretation of literary materials for children. 3 class hours. *Credit, 3.*

252. ADVANCED ORAL INTERPRETATION OF LITERATURE.
Concentration upon the philosophical and technical bases for reading the lyric poem, fiction, drama and documentary materials. Prerequisite, Speech 152. 3 class hours. *Credit, 3.*

253. CHILDREN'S DRAMA I.
Informal dramatics, without an audience, in classroom and recreation programs, serving children's need for creative outlets and furthering awareness, self-expression, self concepts, and social growth through imagination, pantomime, and improvised story dramatization. 3 class hours, observation of demonstration classes. *Credit, 3.*

254. CHILDREN'S DRAMA II.
Formal aspects of children's theatre, the selection and presentation, by adults or older young people, of suitable plays for the child audience. 3 class hours. *Credit, 3.*

257. STAGE AND TELEVISION LIGHTING.
Principles, practices and equipment involved in stage and television lighting. Prerequisites, Speech 115, 140. 3 class hours, 1 2-hour laboratory period. *Credit, 3.*

260. DRAMATIC FORM.
Possible critical approaches to a play with focus on the play script both as a formal unit and as a potential vehicle for dramatic production. 3 class hours. *Credit, 3.*

261. HISTORY OF DRAMATIC THEORY.
A survey of important trends and documents in the history of dramatic theory from Plato to 1900. Prerequisite, Speech 260. 3 class hours. *Credit, 3.*

385 (I), 386 (II). INDEPENDENT STUDY.
For qualified students, independent study and research on selected problems in the four major areas of study. *Credit, 1-3.*

Zoology

Head of Department: Professor Donald Fairbairn. Professors Anderson, Bartlett, Honigberg, Nutting, Rauch, Snedecor; Associate Professors Andrews, Moner, J. Rob-

erts, L. Roberts, H. Rollason, Sargent, Snyder; Assistant Professors Edwards, Kato, Kaulenas, Klingener, Klouda, Ludlam, Mange, O'Connor, Potswald, G. Rollason, Shepard, Wyse; Instructor White.

Each student majoring in Zoology must complete the following Zoology courses: 160 (Principles of Genetics); 306 (General and Cellular Physiology); in 221 or 223 (Comparative Anatomy or Histology); 281 or 282 or 283 (Biology of the Lower Invertebrates or Biology of the Higher Invertebrates or General Parasitology); 246 or 335 or 337 or 350 (Population Genetics or Limnology or Ecology or Animal Behavior); and 366 or 370 or 380 (Vertebrate Physiology or Comparative Physiology or Developmental Biology).

He must attain intermediate proficiency in one of French, German, or Russian by completing a university language course at the 140 level or by achieving a score of 700 or better on College Entrance Examination Board test or on an equivalent test. Study of French, German, or Russian in high school, by itself, is not sufficient.

Students must also complete satisfactorily the following collateral courses: Botany 100 (Introductory Botany); Chemistry 111, 112 (General Chemistry); Chemistry 261, 262, 263, 264 (Organic Chemistry); Biochemistry 223 (General Biochemistry); Mathematics 123, 124 (Analytic Geometry and Calculus); and Physics 141, 142 (Introductory Physics). Students with a special interest in chemistry or chemical biology may, with the approval of the Chemistry Department, substitute Chemistry 113, 114 (General Inorganic Chemistry) for 111, 112; those with a special interest in physics may wish to substitute Physics 161, 162, 163 (General Physics) for 141, 142.

Zoology 101 (Introductory Zoology) is not required of Zoology majors. Students who have not studied biology in high school or who feel that their knowledge of introductory zoology is inadequate may enroll in the course or audit the lectures prior to or concurrently with their enrollment in Zoology 160.

The curriculum for those who plan to become certified secondary school biology teachers requires, in addition to the departmental requirements outlined above, Botany 125 (The Plant Kingdom) and 126 (New England Flora); Psychology 101 (General Psychology) and 301 (Educational Psychology); Education 251 (History of Education) and, in the senior year, the concentrated "Secondary Education Block" of 12 credits of Education courses. Students in the Secondary Education curriculum may, with the permission of their adviser, substitute Zoology 135 (Introductory Physiology) for the requirement of one of the 366-370-380 group provided that the substitution is not made before the student's junior or

senior year, when his plans for secondary teaching have become firm.

101 (I) (II). INTRODUCTORY ZOOLOGY (E).

Principles of zoology including cell structure and metabolism, heredity, development, behavior, evolution, ecology, and the anatomy and physiology of the major groups in the animal kingdom. The course provides background for understanding current biological problems. 2 class hours, 1 3-hour laboratory.

Credit, 3. Staff.

135 (I) (II). INTRODUCTORY PHYSIOLOGY (E).

Circulation, respiration, digestion, metabolism, excretion, chemical and nervous coordination, muscular activity, and reproduction. Prerequisite, Zoology 101. 2 class hours, 1 3-hour laboratory.

Credit, 3. Mrs. Klouda.

137 (I), 138 (II). ANATOMY AND PHYSIOLOGY.

Designed for students in nursing, medical technology and public health; not open to other majors. Prerequisites, Zoology 101, Chemistry 112; credit only for full-year course. 3 class hours. 1 3-hour laboratory.

Credit, 4 per semester. Mrs. White, Mr. O'Connor.

145 (II). HUMAN GENETICS (E).

Introduction to human genetics emphasizing a) principles applicable to all species, b) specific knowledge of man, and c) scientific methodology. Topics include chromosomal and biochemical variations, blood groups, linkage, hypothesis testing, and gene frequency changes in populations. Not open to students majoring in biological sciences. Prerequisite, Zoology 101. 3 class hours.

Credit, 3. Mr. Mange.

160 (I) (II). PRINCIPLES OF GENETICS FOR MAJORS.

See Zoology 240.

200 (I) (II). NATURAL HISTORY.

Designed to orient the student to features of sky, climate, terrain, and organisms that are important in understanding the natural world and in teaching natural science. The laboratory includes methods of identification, collecting data, etc. Open to majors other than Elementary Education only as space permits. Prerequisite, Botany 100 or Zoology 101. 1 class hour, 1 4-hour laboratory.

Credit, 3. Mr. Nutting, Mr. Edwards.

221 (I) (II). COMPARATIVE VERTEBRATE ANATOMY.

Structure and phylogeny of vertebrates. Laboratory work illustrates evolutionary trends and specializations and provides experience in dissection. Prerequisite, Zoology 101 or 160. 2 class hours, 1 3-hour laboratory.

Credit, 3. Mr. Bartlett, Mr. Klingener.

223 (I) (II). HISTOLOGY.

Structure of cells, tissues, and organs as related to function, with emphasis on the mammal; introduction to microtechnique. Prerequisite, Zoology 101 or 160. 2 class hours. 1 3-hour laboratory.

Credit, 3. Mr. Potswald, Mrs. Rollason.

240 (I) (II). PRINCIPLES OF GENETICS FOR NON-MAJORS.

Mechanisms of heredity in plants and animals, emphasizing transmission and action of genes, population genetics, and evolution. Not open to students who have passed Zoology 145. Pre-

requirements, Chemistry 111, one semester of biological science. 3 class hours. *Credit*, 3. Mr. Rauch, Mrs. Shepard, Miss Stroup.

246 (I). POPULATION GENETICS.

Distribution of genes and genotypes within species, emphasizing theoretical models of static and evolving natural populations. Observational and experimental data are considered where such material is available. Prerequisites, Zoology 160 or 240, Mathematics 123. 3 class hours. *Credit*, 3. Mr. Mange.

275 (II). BIOLOGY OF PROTOZOA.

Morphology and physiology of protozoa, with emphasis on contributions made to basic problems of biology through study of these organisms. Prerequisites, Zoology 101 or 160, 2 additional laboratory courses in biological sciences, Chemistry 262. 1 class hour, 1 2-hour and 1 3-hour laboratory. *Credit*, 3. Mr. Honigberg.

281 (I). BIOLOGY OF LOWER INVERTEBRATES.

Survey of invertebrate animals based upon evolutionary and phylogenetic considerations. Includes the Protozoa, Porifera, Cnidaria, Platyhelminthes, Nematoda, Mollusca, etc. Prerequisite, Zoology 101 or 160. 2 class hours, 1 3-hour laboratory. *Credit*, 3. Mr. Nutting, Mr. L. S. Roberts.

282 (II). BIOLOGY OF HIGHER INVERTEBRATES.

Survey of invertebrate animals based upon evolutionary and phylogenetic considerations. Includes the Annelida, Arthropoda, Ectoprocta, Echinodermata, etc. Prerequisite, Zoology 101 or 160. 2 class hours, 1 3-hour laboratory. *Credit*, 3. Mr. Nutting, Mr. L. S. Roberts.

283 (I). GENERAL PARASITOLOGY.

Morphology, life cycles, and physiology of protozoan and helminth parasites, with emphasis on broad aspects of parasitism. Prerequisites, Zoology 101 or 160, Chemistry 112 or 114. 2 class hours, 1 3-hour laboratory. *Credit*, 3. Mr. Honigberg.

300 (I). VERTEBRATE ZOOLOGY.

History, relationships, patterns of distribution, classification of vertebrates, with major emphasis on fishes. Laboratories include field trips. Prerequisite, Zoology 101 or 160. 1 class hour, 2 2-hour laboratories. *Credit*, 3. Mr. Andrews.

302 (II). ICHTHYOLOGY.

Morphology, ecology, and relationships of fishes, and their distribution in space and time. Prerequisite, Zoology 221 or 300. 2 class hours, 1 3-hour laboratory. *Credit*, 3. Mr. Andrews.

306 (II). ORNITHOLOGY.

Avian biology, including structural and functional adaptations, with particular emphasis on behavior. Laboratory includes field trips. Prerequisite, Zoology 101 or 160. 2 class hours, 1 3-hour laboratory. *Credit*, 3. Mr. Bartlett, Mr. Sargent.

308 (II). MAMMALOLOGY.

Evolution, distribution, classification and ecology of mammals. Laboratory includes field trips, preparation of study material, and identification of local fauna. Prerequisite, Zoology 221 or 300. 2 class hours, 1 3-hour laboratory. *Credit*, 3. Mr. Snyder.

335 (II). LIMNOLOGY.

Inland waters, including geological, physical, chemical and biological aspects. Prerequisites, Botany 100, Zoology 101 or 160, Chemistry 112 or 114, Physics 141. 2 class hours, 1 3-hour laboratory or field trip. *Credit*, 3. Mr. Ludlam.

337 (I). ECOLOGY.

Introduction to descriptive and theoretical ecosystems, community, population, and behavioral ecology. The laboratory emphasizes ecologic principles and techniques. Prerequisites, Zoology 101 or 160, Mathematics 124, one semester of invertebrate zoology, preferably Zoology 282. 2 class hours, 1 3-hour laboratory. *Credit*, 3. Mr. Ludlam.

350 (I). ANIMAL BEHAVIOR.

The biological bases of animal behavior, with an analysis of the methods and objectives of current research. Prerequisites, Zoology 101 or 160, and Psychology 101; or Psychology 250. 3 class hours. *Credit*, 3. Mr. Sargent.

360 (I) (II). GENERAL AND CELLULAR PHYSIOLOGY.

Modern trends in physiology with emphasis on chemical and physical properties of cells including cell ultrastructure and metabolism, permeability, muscle contraction and molecular biology. Prerequisites, one year of biology, Biochemistry 223. 2 class hours, 1 3-hour laboratory. *Credit*, 3. Mr. Kaulenas, Mr. Moner.

366 (I). VERTEBRATE PHYSIOLOGY.

Function of organs and organ systems in vertebrates. Not open to students who have passed Zoology 135. Prerequisite, Zoology 360 or Biochemistry 220 or 223. 3 class hours, 1 3-hour laboratory. *Credit*, 4. Mr. Snedecor.

370 (II). COMPARATIVE PHYSIOLOGY.

Physiological principles involved in adaptations of animals to their environment; emphasis in laboratory on experimental methods used to study adaptive mechanisms. Prerequisite, Zoology 360. 2 class hours, 1 3-hour laboratory. *Credit*, 3. Mr. J. L. Roberts.

380 (II) (II). DEVELOPMENTAL BIOLOGY.

Lectures emphasize physiological and biochemical aspects of development. Laboratories deal with descriptive and comparative phases of ontogeny, especially of amphibian, bird, and mammal. Prerequisites, Biochemistry 223, Zoology 360. 2 class hours, 1 3-hour laboratory. *Credit*, 3. Mr. Kaulenas, Mr. Kato.

385 (I), 386 (II). SPECIAL PROBLEMS.

Qualified students who have met departmental requirements for specialization in Zoology may arrange for work on a special problem. *Credit*, 1–3 per semester.

NOTE: Summer courses such as Invertebrate Zoology, Invertebrate Embryology, and Marine Ecology taken at the Marine Biological Laboratory, Woods Hole, Massachusetts or study at other biological field stations will be awarded 3 to 6 credits upon certification of satisfactory achievement in 6 to 12 weeks of study.

Computer Science Program

Acting Head of Program and Director, Research Computing Center: Professor Conrad A. Wogrin. Professor John A. N. Lee; Associate Professor Caxton C. Foster (Associate Director, Research Computing Center); Assistant Professors Stidham and Riseman; Professor of Civil Engineering and Computer Science Archer; Associate Professor of Civil Engineering and Computer Science Stockton; Assistant Professor of Education and Computer Science Ulrich.

121 (I) (II). BASIC FORTRAN.

An introduction to the programming of digital computers. Topics include: basic programming systems, compiler languages, and the logic of programming and compilation. Prerequisites, Mathematics 113 or 123, 2 class hours.

Credit, 1, 1/2 semester, labs required.

122 (I) (II). FORTRAN IV.

A continuation of Computer Science 121, extending Basic FORTRAN to include logical unit input/output, logical arithmetic declaratives, sub-programming techniques, systems and library routines and supervisory control cards. Prerequisites, C.S. 121 or equivalent, 3 class hours.

Credit, 3. lab required.

131 (I) (II). INTRODUCTION TO COMPUTERS AND PROGRAMMING.

Survey course covering the history of computing, an elementary description of computer hardware and peripheral equipment, and an introduction to computer languages. 3 class hours.

Credit, 3. lab required.

132 (I) (II). SURVEY OF COMPUTER APPLICATIONS.

A survey of digital computer problems with an emphasis on the efficiency of programming. Prerequisite, C.S. 121 or C.S. 131 or permission of the instructor.

Credit, 3.

150. ALGORITHMIC METHODS.

The algebraic techniques of the solution of both numerical and non-numerical problems by the computer, including simple problems in algebra, topology, operations research, statistics, Monte Carlo methods, and computational oddities. Prerequisites, C.S. 121, 131 or equivalent. 3 class hours.

Credit, 3.

210. MECHANICAL LANGUAGES.

An introduction to concepts and techniques of syntactical analysis with respect to context free grammars, the recognitive processes involved in the analysis and generative algorithms of computer translators. Special consideration is given to precedence grammars and semantical implications of grammars. Prerequisite, permission of instructor. 3 class hours.

Credit, 3.

211 (II). SYNTACTIC ANALYSIS.

An introduction to the concepts and techniques of syntactical analysis with respect to context free grammars, the recognitive processes involved in the analysis and generative algorithms of computer translators. Special consideration is given to the precedence grammars and semantical implication of grammars. Prerequisite, permission of instructor.

Credit, 3.

223 (I). MACHINE AND ASSEMBLY LANGUAGE.

A description with substantial examples and exercises of the structure of a large scale computer; its operating systems and languages leading to studies of assembly and macro language capabilities. 3 class hours.

Credit, 3.

235. COMPARATIVE MACHINE DESIGN.

A systematic study of the various design concepts of computers with particular reference to the historical influence of certain computer designers. Prerequisite, C.S. 223.

Credit, 3.

250. COMPUTATIONAL MODELLING.

Fundamental principles of modelling on computer selected systems from physical and social science, engineering and business. Prerequisites, Math 124 and C.S. 122 or permission of instructor.

Credit, 3.

251 (I). FINITE DIFFERENCE CALCULUS.

An introduction to difference tables and finite differences leading to the procedures of interpolation and extrapolation theory tablet techniques and to the solution of differential equations. Prerequisites, C.S. 121, 131 or equivalent and Calculus.

Credit, 3.

252 (II). TOPICS IN NUMERICAL METHODS.

Computer oriented course in numerical analysis including linear algebra, solution of simultaneous equations, homogenous equations, eigenvales, solution of differential equations, solution of algebraic and transcendental equations and functional representations. Prerequisites, C.S. 121, 131 or equivalent.

Credit, 3.

270 (I). BOOLEAN ALGEBRA AND SWITCHING THEORY.

Boolean rings, finite and infinite boolean algebras. Simplification theory and dynamic systems. An introduction to boolean algebra, its application to switches, relays and combinatorial circuits. Prerequisite, Philosophy 125.

Credit, 3.

INTERDISCIPLINARY COURSE

ORCHARD HILL 390, 391.

Seminar presented by Orchard Hill fellows and occasional outside lecturers, on such topics as the Soviet Union, the impact of science, the New Left and the University in transition. Although designed for and by Orchard Hill, these seminars may be taken as upper class electives by any University student.

School of Business Administration

WENDELL R. SMITH, *Dean* John T. Conlon, *Associate Dean* Lawrence A. Johnson, *Assistant Dean*
Nelson E. Pion, *Assistant Dean*

Courses and major programs are listed under four departments in the School of Business Administration: Accounting, General Business and Finance, Management and Marketing. Irrespective of any major selected, a certain "core" of courses is required of all students.

Required "core" courses:	Credits
Accounting 100	3
Management 100, Introduction to Computers for Business	3
Finance 201, Corporation Finance	3
General Business 260, Business Law I	3
Management 201, Principles of Management	3
Marketing 201, Fundamentals of Marketing	3

Elective courses shown in major programs are selected with the aid and consent of the student's adviser.

Accounting

Chairman of Department: Professor Carl Dennler, Jr., Professors Anderson, Backer, Corcoran, Lentilhon, Singer; Associate Professors Krzystofik, Morrison; Assistant Professors Burch, Fitzgerald, Motekat, O'Connell, Simpson, Taylor; Instructor Pion.

Required "core" courses	Credits
Required courses in the major:	15
Accounting 261, Intermediate Accounting	21
Accounting 262, Intermediate Accounting	
Accounting 263, Cost Accounting	
Accounting 265, Advanced Accounting	
Accounting 273, Federal Income Tax Procedures	
General Business 261, Business Law II; General Business 262, Business Law III; or General Business 263, Business Law IV	
One elective course in Accounting	3
Three elective courses	9
Four elective courses outside Business Administration	12

100 (I) and (II). INTRODUCTION TO COMPUTERS FOR BUSINESS.

The BASIC and FORTRAN computer programming language with emphasis on the use of the computer for business data process-

ing and problem solving. 3 class hours. (Also listed as Management 100.) *Credit, 3. Staff.*

125 (I) and (II). INTRODUCTION TO FINANCIAL ACCOUNTING.

Introduction to principles underlying the preparation of financial statements. 3 class hours. *Credit, 3. Staff*

126 (I) and (II). INTRODUCTION TO MANAGERIAL ACCOUNTING.

Continuation of Accounting 125 with major emphasis on the development and application of accounting data for planning and control. 3 class hours. *Credit, 3. Staff.*

251 (I) and (II). BUSINESS APPLICATIONS OF COMPUTERS.

Intermediate and advanced computer programming with emphasis on problems in accounting and management information systems. Prerequisites, Acctg. 125, 126 and Acctg./Mgt. 100. 3 class hours. (Also listed as Management 251.)

Credit, 3. Mr. Burch.

252 (II). BUSINESS INFORMATION SYSTEMS.

Study of data-processing methods and techniques as they relate to business information systems with particular emphasis on the role of the accountant and manager in the design and operation of the systems. Attention is also given to complementary methods which may be employed in providing information to management for purposes of control, planning, and decision-making. Prerequisites, Accounting 126 and Accounting 251 or equivalent. (Also listed as Management 252.) 3 class hours.

Credit, 3. Mr. Burch.

261 (I), (II); 262 (I), (II). INTERMEDIATE ACCOUNTING.

Intensive examination of fundamental concepts underlying financial reporting. Study of current literature dealing with effects of alternative methods upon measurement of periodic income. A terminal course for non-accounting majors and a foundation for the accounting major. Prerequisite, Accounting 126. 3 class hours.

Credit, 3. Miss Motekat, Mr. O'Connell, Mr. Simpson, Mr. Taylor.

263 (I) and (II). COST ACCOUNTING.

Methods of cost analysis for job order, process, and standard cost systems, with emphasis on cost control and interpretation. Prerequisite, Accounting 126. 3 class hours.

Credit, 3. Mr. Krzystofik, Mr. Dennler, Mr. Lentilhon.

264 (II). ADVANCED COST ACCOUNTING.

Continuation of Accounting 263 with emphasis on budgetary control, direct costs, and cost analyses for control and decision making. Prerequisite, Accounting 263. 3 class hours.

Credit, 3. Mr. Dennler, Mr. Backer, Mr. Morrison.

265 (I) and (II). ADVANCED ACCOUNTING.

The accounting problems of expanding and declining business enterprises. Emphasis on financial reporting problems of companies that expand by means of acquisition and merger, including foreign subsidiaries. Some coverage of accounting for special sales procedures and fiduciaries. Prerequisite, Accounting 262. 3 class hours.

Credit, 3. Mr. O'Connell, Mr. Simpson.

267 (II). GOVERNMENTAL ACCOUNTING.

Special features of budgetary and fund accounting as applied to municipalities, other governmental units and institutions, such as hospitals and schools. Prerequisite, Accounting 125.

Credit, 3. Mr. Anderson, Mr. O'Connell.

272 (I). ADMINISTRATIVE ACCOUNTING AND CONTROL.

Interpretation and evaluation of accounting data for use in managerial decisions of planning and control. Prerequisite, Accounting 126 or 127. 3 class hours. (Not open to students majoring in Accounting.)

Credit, 3. Mr. Dennler, Mr. Morrison.

273 (I) and (II). FEDERAL INCOME TAX PROCEDURE.

Federal income tax laws and regulations as they affect individuals; preparation of tax returns. Prerequisite, Accounting 125 or 127. 3 class hours.

Credit, 3. Mr. Anderson, Mr. Lentilhon, Mr. Fitzgerald.

274 (II). CPA PROBLEMS.

Extensive practice in solution of problems for C.P.A. examinations. Topics include: proper treatment of assets, liabilities and ownership equity; partnerships; consolidations; funds and cash flow; cost accounting and management uses of accounting information; and governmental accounting. Prerequisite, Accounting 265. 3 class hours.

Credit, 3. Mr. Lentilhon.

277 (I) and (II). AUDITING AND CONTROL.

Basic principles of auditing with emphasis on theory, types of audits, duties and responsibilities of the auditor, audit programs and methods of internal control. Emphasis on the responsibilities of both the independent and internal auditor. Prerequisites, Accounting 262 and 263. 3 class hours.

Credit, 3. Mr. Krzystofik, Mr. Taylor.

278 (I) and (II). ADVANCED FEDERAL TAX PROCEDURES.

A continuation of Accounting 273 emphasizing corporations, partnerships, estates and trusts, gifts and estate taxes, tax planning and research. Prerequisite, Accounting 273. 3 class hours.

Credit, 3. Mr. Anderson, Mr. Fitzgerald.

360 (I). INVENTORY CONTROL.

Mathematical modeling applied to control of inventory investments. Emphasis is also on the recognition of relevant costs for the development and solution of appropriate models. Prerequisites, proficiency with finite and infinitesimal calculus, probability theory, matrix algebra, computer programming, and operations research methodology, or permission of instructor. 3 class hours.

Credit, 3. Mr. Corcoran.

385 (I), 386 (II). INDEPENDENT STUDY AND RESEARCH.

Independent study and research on selected problems in Business Administration. With permission of the chairman of the department.

Credit, 1-3. Staff.

393 (I) and (II). SENIOR HONORS SEMINAR.

Advanced study and research on selected topics in Business Administration and related disciplines. Available only to seniors with 2.8 average or better, and/or by permission of instructor. May be taken both semesters.

Credit, 3.

General Business and Finance

Chairman of Department: Professor James B. Ludtke. Professors Allan, Cheng, Osborn; Associate Professors Barges, Hartzler, Kaczka, Rivers, Silver; Assistant Professors Abranovic, Beals, Belovicz, Bonsignore, Burak, Deets, Eldridge, Goldman, Plattner, Theilman; Lecturer Flanders.

Curriculum in Financial Management

	Credits
SBA upper level "core" courses	15
Other required courses:	15
Finance 210, Financial Institutions, or	
Economics 211, Money, Banking and Credit	
Finance 202 and 203, Problems in Business Finance	
I and II	
Finance 220, Investments	
Finance 230, Principles of Insurance	
Electives in area of concentration, with a minimum	
of 9 credits in Business Administration	18
Electives outside of Business Administration	
and Economics	12

Curriculum in General Business

	Credits
SBA upper level "core" courses	15
Other required courses:	9
Finance 210, Financial Institutions or	
Economics 211, Money, Banking and Credit	
General Business 265, Business and Its Environment	
Accounting 272, Administrative Accounting and	
Control or	
Finance 202, Problems in Business Finance I, or	
Finance 203, Problems in Business Finance II, or	
Management 371, Business Policy and Strategy, or	
Marketing 216, Marketing Management, or	
General Business 250, Administrative Statistics	
Electives in Business Administration	9
Electives in Economics beyond introductory course	
level	9
Electives outside Business Administration and Eco-	
nomics with a minimum of 9 credits in Govern-	
ment, Sociology and/or Psychology beyond	
introductory course level	18

Curriculum in Business Administration and Quantitative Methods
 Freshman Mathematics Requirements
 Desirable but not required that persons considering this major elect the
 Mathematics 123, 124 sequence in place of
 Mathematics 116, 117.
 Sophomore Statistics Requirements
 Special sections of Elementary Statistics 126 and
 252 are offered for persons considering this
 major.

	<i>Credits</i>
Required upper level "core" courses	15
Other required courses:	12
General Business 250, Administrative Statistics	
General Business 253, Introduction to Management Science	
General Business 254, Topics in Management Science	
General Business 256, Management Science Application and Practicum	
Specialization Electives:	21
12 credit hours from a list of quantitative electives	
9 additional credit hours in Business Administration and Economics.	
Electives outside of Business Administration and area of specialization	12

<i>Curriculum in Business Administration and Economics</i>	<i>Credits</i>
SBA upper level "core" courses	15
Other required courses:	9
Finance 210, Financial Institutions, or	
Economics 211, Money, Banking and Credit	
Economics 201, Intermediate Microeconomic Theory	
Economics 214, Macroeconomic Theory and Business Cycles	
Electives in Business Administration and Economics, with a minimum of 12 credit hours in Economics	24
Electives outside of Business Administration and Economics	12

<i>Curriculum in Business Administration with an area of concentration in Urban and Regional Studies</i>	<i>Credits</i>
SBA upper level "core" courses	15
Other required courses:	15
Finance 210, Financial Institutions, or	
Economics 211, Money, Banking and Credit	
General Business 242, Public Utilities	
General Business 270, Real Estate	

General Business 272, Seminar in Urban and Regional Studies
 Landscape Architecture 274, City Planning
 Sociology 251, Urban Sociology
 Economics 281, Regional Economics

Electives in Business Administration, Economics, Government, Sociology, Geography, History, Geology (Recommended, G.B. 242, 265, 385, 386, Economics 281, 282, 314; Government 324; Sociology 251; History 331, 337; Geography 255; Geology 120.)	24
Electives outside the above areas of study	6

FINANCE
 201 (I) and (II). CORPORATION FINANCE.
 Corporate financial behavior; appraisal of factors affecting decision-making regarding sources and application of funds; introduction to capital budgeting and cost of capital problem. Prerequisite, Accounting 125 or permission of instructor. 3 class hours. *Credit, 3. Staff.*

202 (I). PROBLEMS IN BUSINESS FINANCE I.
 Short and intermediate-term financing; decision-making under uncertainty regarding needs and sources of funds. Prerequisite, Finance 201. 3 class hours. *Credit, 3. Staff.*

203 (II). PROBLEMS IN BUSINESS FINANCE II.
 Long term financing, capital budgeting, reserves and dividend policy, pensions, company expansion, merger and consolidation, reorganization. Prerequisite, Finance 201. 3 class hours. *Credit, 3. Staff.*

210 (I) and (II). FINANCIAL INSTITUTIONS.
 The American financial system and functional relationships between financial institutions and economic activities of households, business firms and governmental units. Prerequisites, Economics 125 and Accounting 125. 3 class hours. *Credit, 3. Mr. Cheng, Mr. Ludtke.*

220 (I). INVESTMENTS.
 Development of the general theory of investment with a particular emphasis on the individual investor; practical application of the techniques to real world problems are stressed. 3 class hours. *Credit, 3. Mr. Deets.*

221 (II). THEORY OF INVESTMENT ANALYSIS.
 Detailed investigation into contemporary investment strategies; emphasis is on the theoretical, with portfolio analysis and random walk being the chief topics. Prerequisite, Finance 220 or permission of instructor. 3 class hours. *Credit, 3. Mr. Deets.*

222 (II). THEORY OF INVESTMENT PROCESSES.
 In depth study of portfolio analysis and stochastic processes in security markets; emphasis on quantitative solution techniques and testing procedures. Prerequisites, Finance 220 and the required SBA quantitative courses. 3 class hours. *Credit, 3. Mr. Deets.*

230 (I) and (II). PRINCIPLES OF INSURANCE.

Risks encountered by individuals and business firms and methods and institutions which have been established to insure against financial losses. Various forms of insurance are studied primarily from the buyers' point of view. 3 class hours.

Credit, 3. Mr. Osborn, Mr. Eldridge.

231 (II). LIFE INSURANCE.

Application of life insurance to problems of family security, business security, investments, and estate protection. 3 class hours.

Credit, 3. Mr. Osborn, Mr. Eldridge.

232 (I). EMPLOYEE BENEFIT PLANS.

Design and administration of pension; profit sharing, group life and health insurance plans and other miscellaneous insured fringe benefit programs. 3 class hours.

Credit, 3. Mr. Eldridge, Mr. Osborn.

233 (II). PROPERTY RISKS AND INSURANCE.

Methods of protecting against direct and indirect losses from perils of fire, negligence, marine transportation and dishonesty are emphasized. Insurer operational functions of underwriting, claim adjusting, investing and rate making also are analyzed. 3 class hours.

Credit, 3. Mr. Eldridge, Mr. Osborn.

GENERAL BUSINESS

240 (I). TRANSPORT ADMINISTRATION.

Structure and operation of the domestic transportation system and its functional relationship to production, distribution, and plant location. 3 class hours.

Credit, 3. Mr. Rivers.

241 (II). MANAGEMENT OF TRAFFIC AND PHYSICAL DISTRIBUTION.

Problems of inventory determination, plant location, trade-offs, transport alternatives, warehousing, etc. are considered in a systems concept. Case and problem approach. 3 class hours.

Credit, 3. Mr. Rivers.

242 (I). PUBLIC UTILITIES.

Nature, organization and administration of regulated industries, aspects of public regulation at Federal, state and local levels as they affect service operations. 3 class hours.

Credit, 3. Mr. Rivers.

250 (II). ADMINISTRATIVE STATISTICS.

Probability and statistical distributions applied to business management problems; application of Bayes' theorem to sampling for business decision-making under uncertainty. 3 class hours.

Credit 3. Mr. Belovicz.

253 (I). INTRODUCTION TO MANAGEMENT SCIENCE.

Introductory but rigorous treatment of optimizing and behavioral models in business management involving the use of elementary techniques in finite mathematics, calculus, statistics, and computer programming. Prerequisite, Computer Science 121, three semesters of college mathematics, including one semester of calculus, and one semester of statistics. (Also listed as Management 253.) 3 class hours.

Credit, 3. Staff.

254 (II). TOPICS IN MANAGEMENT SCIENCE.

Deterministic and stochastic models of business management planning and control involving subject matters in efficient allocation

of resources, decision theory, organization theory, game theory, non-linear programming, and simulation. Prerequisite, General Business 253 or equivalent. (Also listed as Management 254.) 3 class hours.

Credit, 3. Staff.

255 (I). STOCHASTIC MODELS IN BUSINESS.

Introduction to the theory of stochastic processes in the formulation of descriptive and normative models and their application to the field of business administration. 3 class hours.

Credit, 3. Staff.

256 (I) and (II). MANAGEMENT SCIENCE APPLICATION AND PRACTICUM.

Provides opportunity to apply theoretical models in "real world" situations; current problems in cooperating firms are investigated by students. 3 class hours.

Credit 3, Staff.

258 (I). QUEUEING THEORY MODELS.

Development and application of models of waiting lines, including single and multiple channel and single and multiple stage queues for various priorities and queue disciplines. Prerequisites, General Business 253 and General Business 254, or permission of instructor. 3 class hours.

Credit, 3. Staff.

259 (II). TIME SERIES ANALYSIS.

The analysis of time series and dynamic models for use in forecasting and control of business and economic systems. 3 class hours.

Credit, 3. Staff.

260 (I) and (II). LAW I.

Nature of law and judicial process; the concept of contract; economic functions and consequences of contracts. 3 class hours.

Credit, 3. Law Staff.

261 (I) and (II). LAW II.

The nature, functions and limitations of Commercial Law. Prerequisite, General Business 260. 3 class hours.

Credit, 3. Law Staff.

262 (II). LAW III.

The economic functions and consequences of agency, partnerships and corporations. Prerequisite, General Business 260. 3 class hours.

Credit, 3. Law Staff.

263 (II). LAW IV.

Legal problems most commonly encountered by certified public accountants with special attention paid to the subjects currently being included in CPA examinations. (Limited to seniors majoring in accounting. Prerequisite, General Business 260. 3 class hours.

Credit, 3. Mr. Goldman.

265 (I) and (II). BUSINESS AND ITS ENVIRONMENT.

Theories and doctrines relating the firm to its environment. Aggregate legal, social, political, and economic factors are integrated in a rigorous examination of competing concepts of the role of business in society. Prerequisite, Senior Class standing or permission of instructor. (Also listed as Management 265.) 3 class hours.

Credit, 3. Mr. Hartzler.

270 (I). REAL ESTATE.

A comprehensive survey of real estate principles and practices; mechanics of the real estate market and economic and legal factors that influence it. 3 class hours.

Credit, 3. Mr. Burak.

272 (II). SEMINAR IN URBAN AND REGIONAL STUDIES.
Analysis of the dimensions of urban growth and change; discussion of the reasons behind, and the problems growing out of the economic growth and stagnation of cities and regions. Prerequisite, General Business 270, or Economics 281, or Economics 282, or permission of instructor. 3 class hours.

Credit, 3. Mr. Burak.

333. MANAGEMENT INTERNSHIP PROGRAM.
Summer service with a cooperating business firm or governmental agency. The student will undertake responsible duties and participate in managerial activities under supervision of experienced executive personnel. A written report is required. Open only with permission of department chairman. Credit, 3.

385 (I), 386 (II). INDEPENDENT STUDY AND RESEARCH.
For qualified seniors, independent study and research on selected problems in Business Administration. With permission of the chairman of the department. Credit, 1-3. Staff.

393 (I) and (II). SENIOR HONORS SEMINAR.
Advanced study and research on selected topics in Business Administration and related disciplines. Available only to seniors with 2.8 average or better, and/or by permission of instructor. May be taken both semesters. Credit, 3.

Management

Chairman of Department: Professor George B. Simmons.
Professors Conlon, Hare, Litterer, McGarrah, O'Donnell, Wortman, Young; Associate Professors Bornstein, Carlisle, Chen, Claunch, Elkins, Frey, Michael; Assistant Professors Finch, Jones, Tonnesen; Lecturer Brooke.

Required School of Business Administration "core"	Credits 15
Required Management "core"	12
Management 214, Personnel Management	
Management 231, Administrative Theory	
Management 247, Production Management I	
Management 371, Business Policy and Strategy	
Seven courses chosen with the concurrence of the adviser to include, typically, the following:	

Curriculum in General Management

- Management 265, Business and Its Environment
- Management 341, Management Decision Simulation
- Management 342, Planning and Control Systems
- Management 391, Seminar in Administration

Curriculum in Personnel Management and Industrial Relations

- Management 344, Management-Union Relations I
- Management 345, Management-Union Relations II
- Management 392, Seminar in Personnel Management

Curriculum in Production Management

- Management 248, Production Management II
- Management 341, Management Decision Simulation
- Management 342, Planning and Control Systems
- Management 393, Seminar in Operations Management

Curriculum in Systems Management

- Management 341, Management Decision Simulation
- Management 342, Planning and Control Systems
- Management 393, Seminar in Operations Management
- And one of the following:
 - Accounting 272, Administrative Costing and Control
 - Industrial Engineering 256, Data Processing and Information Handling Systems
 - Economics 301, Decision Theory
 - Statistics 271, Sampling Theory and Methods

Curriculum in Business Administration and Quantitative Method

- Statistics 316, Introduction to the Theory of Statistics II
- Statistics 281, Multivariate Analysis
- Management 253, Introduction to Management Science
- Management 254, Topics in Management Science
- Management 385, Independent Study and Research
- General Business 250, Administrative Statistics
- And at least one of the following:
 - Statistics 261, Design of Experiments
 - Statistics 271, Survey Sampling
 - Computer Science 222, FORTRAN IV
 - Mathematics 233, Probability
- Management 214, 231, and 371 are not required in this curriculum

Elective courses from outside Business Administration	11 or 12
100 (I) and (II). INTRODUCTION TO COMPUTERS FOR BUSINESS. The BASIC and FORTRAN computer programming languages, with emphasis on the use of the computer for business data processing and problem solving. (Also listed as Accounting 100.) 3 class hours. Credit, 3.	
201 (I) and (II). PRINCIPLES OF MANAGEMENT. Basic course dealing with fundamental principles and practices of the managerial process in business enterprises. 3 class hours. Credit, 3.	
214 (I) and (II). PERSONNEL MANAGEMENT. Principles and policies followed by management in recruitment, development, direction, and control of personnel. 3 class hours. Credit, 3.	
231 (III). ADMINISTRATIVE THEORY. Principles of administration, modern organization theories, specialization, functionalization, coordination, planning, and control, authority, status, leadership, decision-making, communication, and power-structuring. Prerequisite, Management 201. 3 class hours. Credit, 3.	

234 (II). WAGE AND SALARY ADMINISTRATION.

Objectives, procedures, and problems involved in establishment and administration of operative and executive compensation plans. Prerequisite, Management 214. 3 class hours. *Credit, 3.*

247 (II). PRODUCTION MANAGEMENT I.

Basic principles of production management. Use of statistical, mathematical, and simulation methods in production, or operations, aspect of an organization's activities. Prerequisite, Management 201. 3 class hours. *Credit, 3.*

248 (I). PRODUCTION MANAGEMENT II.

Application of principles and analytical techniques to design and operation of production systems. Quality control, inventory and production control. Prerequisite, Management 247. 3 class hours. *Credit, 3.*

251 (I) and (II). BUSINESS APPLICATIONS OF COMPUTERS.

Intermediate and advanced computer programming with emphasis on problems in accounting and management information systems. Prerequisites, Accounting 125 and 126, and Management 100. (Also listed as Accounting 251.) 3 class hours. *Credit, 3.*

252 (II). BUSINESS INFORMATION SYSTEMS.

Data-processing methods and techniques as they relate to business information systems with particular emphasis on the role of the accountant and manager in the design and operation of the systems. Attention is also given to complementary methods which may be employed in providing information to management for purposes of control, planning, and decision-making. Prerequisites, Accounting 126 and Management 251 or equivalent. (Also listed as Accounting 252.) 3 class hours. *Credit, 3.*

253 (I). INTRODUCTION TO MANAGEMENT SCIENCE.

Introductory but rigorous treatment of optimizing and behavioral models in business management involving the use of elementary techniques in finite mathematics, calculus, statistics, and computer programming. Prerequisite, Computer Science 121, and three semesters of college mathematics, including one semester of calculus, and one semester of statistics. (Also listed as General Business 253.) 3 class hours. *Credit, 3.*

254 (II). TOPICS IN MANAGEMENT SCIENCE.

Deterministic and stochastic models of business management planning and control involving subject matters in efficient allocation of resources, decision theory, organization theory, game theory, non-linear programming, and simulation. Prerequisite, Management 253 or equivalent. (Also listed as General Business 254.) 3 class hours. *Credit, 3.*

265 (I) and (II). BUSINESS AND ITS ENVIRONMENT.

Theories and doctrines relating the firm to its environment. Aggregate social, political, legal and economic factors are integrated in a rigorous examination of competing concepts of the role of business in society. Prerequisite, Senior Class standing or permission of instructor. (Also listed as General Business 265.) 3 class hours. *Credit, 3.*

333. MANAGEMENT INTERNSHIP PROGRAM.

Summer service with a cooperating business firm or governmental agency. The student will undertake responsible duties and participate in managerial activities under supervision of experienced executive personnel. A written report is required. Open only with permission of department chairman. *Credit, 3.*

341 (I). MANAGEMENT DECISION SIMULATION.

Participation in management of a firm in a simulated industry. Students, organized into management teams, apply their knowledge of business administration and economics in a competitive struggle for profit and market position. Prerequisite, Senior Class standing and permission of instructor. 3 class hours. *Credit, 3.*

342 (II). PLANNING AND CONTROL SYSTEMS.

Systems coordinating sales, production, finance and other business functions and producing information required for adjustment and reformulation of plans over time. Both single-use and continuous-use plans are considered. Special attention is given to design of organization structure and development of control criteria. Prerequisite, Senior Class standing. 3 class hours. *Credit, 3.*

344 (I). MANAGEMENT-UNION RELATIONS I.

Comparison of union-management objectives, functions, and structures, including scope and impact of union penetration into areas of managerial authority. Prerequisite, Management 201 or 214. 3 class hours. *Credit, 3.*

345 (II). MANAGEMENT-UNION RELATIONS II.

Problems in the interpretation and administration of collective bargaining agreements are studied by use of the case method of analysis. Prerequisite, Management 344 or permission of instructor. 3 class hours. *Credit, 3.*

371 (II). BUSINESS POLICY AND STRATEGY.

An integrating course embracing all organic management functions. Cases are used as subjects for analysis and systematic decision-making practice. Prerequisites, Management 201 and Senior Class standing. 3 class hours. *Credit, 3.*

385 (I), 386 (II). SPECIAL PROBLEMS.

For qualified seniors. Independent study and research on selected problems in Business Administration. With permission of chairman of the department. *Credit, 1-3.*

391 (I). SEMINAR IN ADMINISTRATION.

Advanced study and individual research in theory and practice of administrative organization and behavior. Prerequisite, Senior Class standing and permission of instructor. 3 class hours. *Credit, 3.*

392 (II). SEMINAR IN PERSONNEL MANAGEMENT.

Advanced study of current problems in development and administration of personnel programs. Research methodology and recent research findings emphasized. Each student required to complete a major research project. Prerequisite, Senior Class standing and permission of instructor. 3 class hours. *Credit, 3.*

393 (I) and (II). SENIOR HONORS SEMINAR.
Advanced study and research on selected topics in Business Administration and related disciplines. Available only to seniors with 2.8 average or better, and/or by permission of instructor. May be taken both semesters. Credit, 3.

394 (II). SEMINAR IN OPERATIONS MANAGEMENT.
Specialized topics and advanced techniques in production and operations management. Prerequisite, Management 247. 3 class hours. Credit, 3.

Marketing

Chairman of Department: Professor Jack S. Wolf. Professor Smith; Associate Professors Frederick, Johnson, Paul, Schwartz, Venkatesan; Assistant Professors Barber, Guiltinan, Monroe, Wiek, Worthing; Lecturer Liander.

<i>Curriculum in Marketing</i>	<i>Credits</i>
Required School of Business Administration courses	"core" 15
Required courses in the major:	12
Marketing 210, Buyer Behavior	
Marketing 212, Marketing Research	
Marketing 214, Marketing Models	
Marketing 216, Marketing Management	
Two elective advanced behavioral science courses	6
Two elective advanced economics courses	6
Elective courses either inside or outside the School of Business Administration and the Department of Economics	21

<i>Curriculum in Marketing and Quantitative Methods</i>	
Required School of Business Administration courses	"core" 15
Other required courses:	18
Marketing 212, Marketing Research	
Marketing 214, Marketing Models	
Marketing 216, Marketing Management	
General Business 253, Introduction to Management Science	
General Business 254, Topics in Management Science	
General Business 250, Administrative Statistics	
Two advanced behavioral science electives	6
Two advanced economics electives	6
Electives courses either inside or outside the School of Business Administration and the Department of Economics	15

201 (I) and (II). FUNDAMENTALS OF MARKETING.
The role of marketing in our economic and social structure. The planning, distribution, pricing and promotion of goods and serv-

ices to consumer and industrial markets, viewed as internal activities of the firm, and also as they are shaped by environmental forces. Prerequisites, Economics 125, Psychology 101, Sociology 101, or permission of instructor. 3 class hours. Credit, 3. Mrs. Barber.

210 (I) and (II). BUYER BEHAVIOR.
Analysis of buyer motivation and buying behavior, including explanatory theories of consumer market behavior and models of the decision-making process for winning patronage. Prerequisite, Marketing 201 or permission of instructor. 3 class hours. Credit, 3. Mr. Venkatesan.

212 (I) and (II). MARKETING RESEARCH.
The systematic gathering, recording and analyzing of data about problems relating to the marketing of goods and services. Individual case study and research projects. Prerequisites, Marketing 201 and Statistics 121, or permission of instructor. 3 class hours. Credit, 3. Mr. Frederick, Mr. Guiltinan, Mr. Monroe.

213 (II). ADVANCED MARKETING RESEARCH.
Select areas of marketing research. Emphasis on non-survey research techniques in marketing. Substantive problems of experimental research and research design and analysis. Class problems will consist of laboratory or field experiments. Prerequisite, Marketing 212, or permission of instructor. Credit, 3. Mr. Venkatesan.

214 (I) and (II). MARKETING MODELS.
Relates a number of mathematical concepts and techniques to the analysis and solution of marketing management problems. Mathematical models as aids to decision making in marketing will also be included. Prerequisites, Marketing 201, Mathematics 115, 116, 117, and Statistics 121, or permission of instructor. 3 class hours. Credit, 3. Mr. Frederick, Mr. Monroe.

216 (I) and (II). MARKETING MANAGEMENT.
An advanced understanding of the nature and problems of marketing management, focusing on the process of marketing management, the environments facing the marketing manager, and the tools available for environmental analysis and the control of marketing activities. Prerequisite, Marketing 201 or permission of instructor. 3 class hours. Credit, 3. Mr. Paul, Mr. Worthing.

219 (I) and (II). MARKETING STRATEGY.
Exposure to realistic problems through computerized simulation and analysis of cases. Provides practice in seeking solutions to marketing problems through an integration of factors pertinent to the development of marketing strategies. Prerequisite, Marketing 201 or permission of instructor. 3 class hours. Credit, 3. Mr. Wolf.

221 (I) and (II). PRODUCT PLANNING AND DEVELOPMENT.
Examination and analysis of the factors pertinent to effective product decisions by marketing managers. The organization of the product planning function, matching products and markets, and methods for reducing new product risk are among the topics covered. Prerequisite, Marketing 201 or permission of instructor. 3 class hours. Credit, 3. Mr. Worthing.

222 (I) and (II). **MARKETING COMMUNICATIONS.** Development of effective marketing communication strategies based upon an understanding of the characteristics of audiences. Conceptual material from communications theory is also included. Prerequisite, Marketing 201 or permission of instructor. 3 class hours. Credit, 3. Mr. Wiek.

223 (I) and (II). **MARKETING NETWORK ANALYSIS.** A systems approach to the management of all activities that facilitate the movement of goods and coordination of supply and demand. The course includes the problems of designing and managing a product distribution network. Prerequisite, Marketing 201 or permission of instructor. 3 class hours.

Credit, 3. Mr. Monroe, Mr. Wiek.

224 (II). **ANALYSIS FOR PRICING DECISIONS.** The relationship of pricing objectives, methods, and policies to market behavior and the goals of the firm. Pricing models and contributions of behavioral sciences to pricing analysis are also included. Prerequisite, Marketing 201. 3 class hours.

Credit, 3. Mr. Monroe.

237 (I). **INTERNATIONAL MARKETING.** Covers background material useful to United States business enterprises which market goods and services in foreign countries. Emphasis will center on the firm's marketing operations and the design of marketing strategy. Prerequisite, Marketing 201 or permission of instructor. 3 class hours.

Credit, 3. Mr. Liander.

385 (I), 386 (II). **INDEPENDENT STUDY AND RESEARCH.** For qualified seniors, independent study and research on selected problems in Business Administration. With permission of the chairman of the department. Credit, 1-3. Staff.

390 (II). **SEMINAR IN MARKETING.** Advanced study and individual research on selected problems and current issues in marketing. Each student is required to complete a major research project. Prerequisite, senior standing and permission of instructor. 3 class hours. Credit, 3. Staff.

393. (I) and (II). **SENIOR HONORS SEMINAR.** Advanced study and research on selected topics in business administration and related disciplines. Available only to seniors with 2.8 average or better, and/or by permission of instructor. May be taken both semesters. Credit, 3.

RELATED COURSES.

ACCOUNTING 272, Administrative Costing and Control
GENERAL BUSINESS 241, Management of Traffic and Physical Distribution

GENERAL BUSINESS 250, Administrative Statistics
GENERAL BUSINESS 253, Introduction to Management Science
MANAGEMENT 265, Business and its Environment
MANAGEMENT 342, Planning and Control Systems

School of Education

DWIGHT ALLEN, *Dean* Richard Coffing, *Assistant Dean* Earl Seidman, *Assistant Dean*
Robert Woodbury, *Assistant Dean*

Professors Anthony, Fischer, Ivey, Jordan, Parody, Simon, Ulin, Weinstein, Wolf, Wyman; Associate Professors Anderson, Cappelluzzo, Carew, Coffing, Day, Ertel, Eve, Fredrickson, Griffiths, Jones, Kornegay, Lauroesch, O'Leary, Schimmel, Thelen, Woodbury, Zimmer; Assistant Professors Berliner, Blane, Budde, F. Thomas Clark, Richard J. Clark, Jr., Cooper, Eddy, Edgecomb, Eiseman, Evans, Fanslow, Flight, Forsythe, Haase, Hakstian, Hambleton, Hawkes, Hutchinson, Jones, Julius, Konicek, Seidman, Sinclair, Ulrich, Urch, Wagschal, Yarington; Lecturers Brown, Brownward, France, French, George, Gentry, Gorth, Lyon, Rhodes, Wideman, Wuerthner; Instructors Cebula, Cyr, Johnson, Rudman, Wightman; Visiting Lecturer Spalding.

The academic program for the School of Education has been reorganized, following an intensive period of planning. The undergraduate programs cover a broad area of educational interests and specialties, as well as innovative approaches to teacher training. The School of Education offers both a teaching and a non-teaching major in edu-

cation. Each center provides for students who desire a non-teaching course of study. Teaching majors in elementary education will receive all the courses they need for certification, and appropriate courses for secondary education majors are also negotiated through the Center for Teacher Education, a Kindergarten through Twelfth Grade training program (See description below).

The reorganization has brought about the establishment of eleven learning centers, ranging from Aesthetics in Education, Humanistic Education, and International Education, through the spectrum to Urban Education. Students may enroll in courses in any center with the advice of a student counselor. Although education majors will take specific courses leading to teacher certification, they will also have a variety of other courses from which to choose. Undergraduates from other University departments as well as students from the Five-College Community are encouraged to enroll in either short or long term educational experiences evolving out of new innova-

tive offerings from the School of Education. These might include week-end retreats, a movie and seminar series, or a weekend living experience in a nearby ghetto area.

Programs now being offered include teacher training, curriculum, counseling and guidance, school administration and organization, higher education, philosophy and history of education, compensatory education, early childhood education, educational media, research in education, and educational change. A complete list of centers and programs follows this description.

This greatly expanded curriculum is the result of a tripling in faculty and doctoral candidates. Students are encouraged to exercise initiative in directing their own educational program, provided that they cover the necessary courses for credentialing, if this is their intent. Under this focus of learning centers and student directed learning, it is expected that new programs will be constantly evolving in areas which have a high degree of social and educational relevance.

Students who are interested either in teaching as a career or education as an area for undergraduate study are invited to contact the Dean's Office of the School of Education for detailed information and counseling regarding available programs.

DESCRIPTION OF LEARNING CENTERS

1. Center for Aesthetics in Education

The programs offered by the Center are interdisciplinary in nature and will utilize the facilities of the Five Colleges to implement their courses of study. Introductory courses and practica are offered in three basic areas:

1) problem solving through a variety of cognitive and affective experiences; 2) reading and discussion of theories and philosophies of aesthetics in education; and 3) the use of artistic media to illustrate basic concepts in the sciences and humanities.

2. Center for Counsellor Education

The Center for Counsellor Education has three main foci: 1) the identification of occupational and personal choice patterns and the contribution of formal education to these choices; 2) the development of personnel with special competence to assist students in making these choices; and 3) the investigation of new environments, methods, and personnel which might make such choices more effective.

A core of integrated courses and experiences will be required for counselling majors. The core sequence organizes material so that content is integrated with application.

3. Center for Educational Research

The Center for Educational Research maintains the belief that the empirical study of educational processes is the single most important method for the advancement of education, both in terms of developing new knowledge and in terms of providing systematic information and analyses of current practices. The Center will not only seek to serve research needs within the community, but will also recruit and train, for all levels, educational personnel interested in applying behavioral science methods to relevant educational problems capable of furthering knowledge about behavioral science processes.

The primary function of the Center is to provide an intelligent environment conducive to quality educational research. This environment would include pursuit of research and scholarship both in the field and at the University through a differentiated team approach.

4. Center for Humanistic Education

Humanistic Education is a new curriculum area with its own teaching methodology. We feel that it is both necessary and possible to develop such a program of instruction to promote and deal directly with the concerns, needs and personal reactions of the student. Thus, the student's repertoire of behaviors for negotiating with himself, with others and with social institutions constitutes the content of a program in Humanistic Education. Humanistic Education will give almost total attention to the learner, for he is—in fact—the subject matter of the program. His concerns about his own identity, his sense of affiliation, and his concern for his own personal power will structure the type of curriculum he will experience.

5. Center for International Education

"International Education" is, by definition, the institutionalized process of the mobilization and building of human resources for active participation in a world-centered system of education and human development.

The programs, courses and experiences offered by the Center are designed to: 1) help foster the knowledge and understanding of students regarding subcultures of our nation and cultures of the world; 2) help prepare them for leadership roles in the international affairs of our nation; and 3) prepare them to work with the socio-economic and political development of other nations via the medium of education. Students who enter programs offered by the Center may prepare to teach at any educational level at home and abroad or for nonteaching roles in the field of international education.

6. Center for Leadership in Educational Administration

The leader-administrator exerts his influence on his associates whether in schools, colleges, universities, unions or other agencies. Candidates will be provided courses

and experiences relevant to the development of leader-administrator skills and also will be advised how and where they may find courses and experiences available elsewhere. There will be teaching, practicum, and internship experiences drawn from the public schools, the non-public schools, and the Five-College consortium. It is expected that much of the work will be offered by the School of Education through the Center for the Study of Educational Innovation, the Center for International Education, and the Center for Urban Education.

7. Center for the Study of Educational Innovations

The Center was created to inquire systematically into processes of educational change and to bring about school improvement. To this end, CSEI developed three interdependent action units, which are: 1) Working on creating and improving educational practices. 2) Evaluating and conducting research on current and experimental practices, as well as on strategies for bringing about change. 3) Developing ways for schools in Massachusetts and elsewhere to take advantage of the available knowledge about innovations.

Because it is involved in the above activities, the Center can provide training for students in various phases of proposal development, conference and workshop planning, innovation conceptualization and development, research and evaluation, administration, teaching and consultation. The amount of credit earned will vary, depending on the intensity and the quality of the supervised experience.

8. Center for Educational Media and Technology

The Center for Educational Media and Technology offers learning, service and research opportunities in conventional audio-visual media and library areas as well as the newer areas of television, film and systems technology. Other innovative devices, materials and processes will be included as they develop.

The programs are interdisciplinary in nature and will utilize the facilities of the University of Massachusetts to implement its courses of study.

The Educational Media and Technology curriculum consists of experiences from which the student may select. It is divided into the areas of theory, practice and application and the instructional experiences have been arranged so that they may be offered flexibly within this independent study, projects and other forms of modular experiences.

9. Center for Foundations of Education

The Center for Foundations of Education serves several functions in the School of Education. In the preparation of teachers, the study of the history, philosophy and sociology of education and comparative education,

it provides undergraduate and graduate students with a substantial background of interpretative knowledge about the processes and institutions of education. Study within the Center can provide a longer time perspective to the prospective teacher and can bring information to bear upon educational problems that set them in their proper contexts.

In service to the entire School of Education, persons in the Center are equipped to analyze educational problems, ideas and ideologies from disciplinary points of view usually not represented in other areas of the School.

10. Center for Urban Education

The Center for Urban Education intends to establish itself as a long-range planning, research and training center focusing on the development of new models for education in urban areas. Four areas of concentration are available: 1) Community Relations, 2) School Structure, 3) Curriculum, and 4) Teacher Training. A primary goal of the Center is to train experts in urban community relations. With community support, structural and curriculum changes can be introduced into the schools. Integral with this goal is the training of future teachers who can cope with the challenges of urban realities. Teachers in training will be offered live-in experiences in the city, community involvement, and varied classroom experiences in city schools.

11. Center for Teacher Education

This Center represents a fresh approach to teacher training based on the premise that an early introduction of potential teachers to students through such devices as strength training, micro-teaching and direct classroom participation, will focus the student on his particular interests and identified needs.

The purpose of the Center for Teacher Education is: 1) To provide training for prospective teachers in kindergarten through grade twelve. 2) To design, implement, and evaluate programs and program components for the preparation of teachers. 3) To conduct research experiments in new training procedures, methods, and curricula. 4) To design programs for graduate students who aspire to be teacher educators in general and specific curriculum areas.

It is becoming increasingly evident to many educators that the similarities in the preparation of elementary and secondary teachers outweigh the differences. While some of the specific subject matter areas may be different, the teaching strategies and the approaches for learning these subjects are often very similar. We believe that a total teacher education program based on a K-12 approach offers advantages not found in the traditional elementary and secondary programs.

SPECIAL PROGRAMS AND COURSES

The School also offers several special programs and courses that respond to new interests and needs. They are more temporary and have fewer resources than Centers, but encourage new experiments and new juxtapositions of resources. Some fill special needs; others may eventually become major Centers in the School.

- Contemporary University
- Early Childhood Education
- Higher Education
- Instructional Applications of Computers

- Junior Year Off-Campus
 - M.A.T. (Community Colleges) Degree Program
 - Program in Education and Public Policy
 - Research and Training in Compensatory Education
 - Special Programs in Teacher Education
 - Student-Centered Degree
 - Systems Applications in Education
 - Undergraduate B.A. in Special Education
 - Vocational/Technical Education Program
- For further information on these programs, contact Dean Seidman.

School of Engineering

KENNETH G. PICHA, *Dean* E. Ernest Lindsey, *Associate Dean* Joseph S. Marcus, *Associate Dean*
Roscoe F. Ward, *Acting Associate Dean*

The School of Engineering has the following common courses for the Freshman Year.

The recommended program is:

1st Semester	Credits
English 111	2
Mathematics 123	3
Chemistry 111 or 113	3 or 4
Engineering 103 or 104	3
Social Science Elective	3
Physical Education 100	1
	15 or 16
2nd Semester	
English 112	2
Mathematics 124	3
Chemistry 112 or 114	3 or 4
Engineering 103 or 104	3
Physics 161	4
Speech	2
Physical Education 100	1
	18 or 19

ENGINEERING

103. INTRODUCTION TO ENGINEERING.
Introduction to the nature of engineering practice through study of some generally useful concepts to be developed in more detail in later courses. These are developed through lectures and problem work. 1 lecture hour. Two 2-hour problem or laboratory periods per week.
Credit, 3.

104. ENGINEERING PROBLEMS.
Computation theory and the FORTRAN Programming language with emphasis on solving engineering problems utilizing the computer. 1 lecture hour. Two 2-hour laboratory-recitations.
Credit, 3.

Chemical Engineering

Head of Department: Professor John W. Eldridge. Professors Cashin, Douglas, Lenz, Lindsey, Middleman, Roblee, Vanpee; Associate Professors Kirk, Laurence, McAvoy, Short; Assistant Professor Novak; Adjunct Associate Professor Chappellear.

SOPHOMORE YEAR

1st Semester	Credits
Ch. E. 125, Fundamentals	3
Chem. 160, Organic	3
Physics 162, General Physics II	4
Math. 173, Analytic Geometry and Calculus III	3
Engl. 125, Western Literature	3
Ch. E. 101, Chemical Engineering Practice I	1
	17
2nd Semester	
Ch. E. 126, Chemical Engineering Thermodynamics	3
Ch. E. 258, Organic Chemical Technology	3
Physics 163, General Physics III	4
Math. 187, Differential Equations for Engineers	3
Engl. 126, Western Literature	3
Ch. E. 102, Chemical Engineering Practice II	1
	17

JUNIOR YEAR

1st Semester	Credits
Ch. E. 255, Chemical Engineering Fluid Mechanics	3
Ch. E. 374, Simulation	3
Chem. 285, Physical Chemistry	3
Math. 174, Analytic Geometry and Calculus IV	3
Elective	3
Ch. E. 201, Chemical Engineering Practice III	1
	16

2nd Semester	
Ch. E. 256, Chemical Engineering Heat Transfer	3
Ch. E. 257, Mass Transfer	3
Chem. 286, Physical Chemistry	3
Chem. 288, Physical Chemistry Laboratory	2
Engl. 331, Technical Writing	2
Elective	3
Ch. E. 202, Chemical Engineering Practice IV	1
	17

SENIOR YEAR

1st Semester	
Ch. E. 358, Staged Operations	4
Ch. E. 380, Kinetics and Reactor Design	3
Ch. E. 383, Process Evaluation	3
Chem. 219, Electronics Instrumentation	3
Elective	3
Ch. E. 301, Chemical Engineering Practice V	1
	17

2nd Semester	
Ch. E. 376, Process Control and Dynamics	3
Ch. E. 384, Process and Plant Design	3
Ch. E. 392, Seminar	2
Electives	5 or 6
Ch. E. 302, Chemical Engineering Practice VI	1
	14 or 15

NOTE: The electives must include, to satisfy University core requirements, at least one 3-credit humanities course plus at least three 3-credit courses (chosen from at least 2 departments) in the social sciences. Note that ROTC study must be in addition to the normal load.

101, 102, 201, 202, 301, 302. CHEMICAL ENGINEERING PRACTICE I-VI.

By means of laboratory investigations, classroom demonstrations, films, plant trips and invited speakers, theoretical lecture material is related to industrial practice. Each Chemical Engineering Practice course is closely coordinated with lecture material the student is taking concurrently and emphasizes the application of basic concepts in the solution of industrial problems. Corequisite, the concurrent Ch.E. courses for that semester of the curriculum,

or permission of instructor. 3 hour laboratory period or 1 hour demonstration or lecture.

Credit, 1 each semester of the Sophomore, Junior and Senior years.

125 (I). FUNDAMENTALS.

Nature and scope of chemical engineering through study of selected chemical processes and of material and energy balances. Prerequisite, Chemistry 112 or 114. 2 class hours, 1 2-hour computation period. Credit, 3.

126 (II). CHEMICAL ENGINEERING THERMODYNAMICS.

The fundamental principles of Thermodynamics. An in-depth discussion of the First and Second Laws; study of properties of single-component systems, thermodynamic cycles, phase and chemical equilibria. Solution methods for complex energy and material balance problems are introduced. Prerequisites, Chem. 160, Math. 173, Ch.E. 125. 2 class hours, 1 2-hour computation period. Credit, 3.

255 (I). CHEMICAL ENGINEERING FLUID MECHANICS.

An introduction to momentum transport in fluids including the development of the Navier-Stokes equations and boundary layer analysis. Emphasis on the application of the theory to laminar and turbulent flow in chemical process equipment such as: flow meters, pipes, pumps, packed beds, filtration equipment, sedimentation and classification units, etc. Prerequisites, Ch.E. 126, Math. 187. 3 class hours. Credit, 3.

256 (II). CHEMICAL ENGINEERING HEAT TRANSFER.

Theory of heat transfer by conduction, convection, and radiation with applications to the Unit Operations of Chemical Engineering. Prerequisite, Ch.E. 255. 3 class hours. Credit, 3.

257 (II). MASS TRANSFER.

Theory and application of diffusional phenomena. Microscopic and macroscopic problems of mass transfer, diffusion in a boundary layer, diffusion and chemical reaction, interphase transfer. The continuous contactor provides the framework in which are analyzed absorption, extraction, chromatographic separators and simultaneous heat and mass transfer. Prerequisite, Ch.E. 255. 3 class hours. Credit, 3.

258 (II). ORGANIC CHEMICAL TECHNOLOGY.

Applications of the principles of structure and reaction mechanisms of organic chemistry in the preparation and use of industrially-important organic chemicals and polymers. Prerequisite, Chemistry 160 or permission of the instructor. 3 class hours. Credit, 3.

358 (I). STAGED OPERATIONS.

An introduction to the design of equilibrium stage processes. Topics include the thermodynamics of phase equilibria, binary and multicomponent distillation, absorption, extraction, leaching and azeotropic phenomena. Prerequisites, Ch.E. 126, Ch.E. 256 and 257. 3 class hours, 1 2-hour computation period. Credit, 4.

361 (I). CHEMICAL ENGINEERING ANALYSIS I.

Mathematical techniques applied to chemical engineering problems. Emphasis is on ordinary differential equations corresponding to specific problems and on their solution. Prerequisites, Chemical Engineering 256 and 257. 3 class hours. Credit, 3.

362 (II). **CHEMICAL ENGINEERING ANALYSIS II.**
Mathematical analysis of chemical engineering problems continued. Topics include: matrix methods, vector analysis, calculus of finite differences, numerical solution of ordinary and partial differential equations, complex variables and Laplace transformations. Emphasis on applying these techniques to real chemical engineering processes and on the physical and mathematical interpretation of the results. Prerequisite, Ch.E. 361. 3 class hours. *Credit, 3.*

363 (I). **SURVEY OF NUCLEAR ENGINEERING I.**
Principles of reactor physics and problems involved in design and operation of nuclear reactors; heat transfer, shielding, instrumentation and waste disposal. Prerequisites, Chemistry 112 or 114; Physics 142 or 162; Mathematics 186, or equivalent; and permission of instructor. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

364 (II). **SURVEY OF NUCLEAR ENGINEERING II.**
Continuation of Course 363; emphasis on reactor physics. Prerequisite, Chemical Engineering 363. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

374 (I). **SIMULATION.**
Simulation of physical processes using both analog and digital techniques. Topics include: programming of analog computers (linear and non-linear components, scaling, iterative operation), solutions of linear and non-linear differential equations, simulation languages, useful numerical techniques (Runge-Kutta, relaxation). Prerequisite, Math. 187. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

376 (II). **PROCESS CONTROL AND DYNAMICS.**
Theoretical and practical factors governing automatic control of industrial processes; control systems, review of measurement devices, control modes, mathematical relationships and analysis of control systems. Prerequisites, Chemical Engineering 374; Mathematics 187. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

380 (I). **KINETICS AND REACTOR DESIGN.**
Principles underlying rates of transformations of matter and energy. Review of pertinent differential equations; effect of temperature and catalysis on chemical reaction rates; application to design of chemical reactors. Prerequisites, Chemical Engineering 126, Chemistry 286. 3 class hours. *Credit, 3.*

383 (I). **PROCESS EVALUATION.**
Solution of problems which require the use and integration of principles studied in previous courses. Final results will be determined by application of economic considerations. Prerequisites, Chemical Engineering 256, 257; Chemistry 286. 2 class hours, 1 3-hour computation period. *Credit, 3.*

384 (II). **PROCESS AND PLANT DESIGN.**
Optimum design of selected chemical plants; production rates, site location, process flow diagrams, equipment design and sizing, total costs, etc. Prerequisite, Chemical Engineering 383. 2 class hours, 1 3-hour computation period. *Credit, 3.*

385 (I). **LABORATORY PROJECTS.**
Investigation and report on an elementary problem. Prerequisites, Chemical Engineering 256 and 257. 1 3-hour laboratory period. *Credit, 1.*

386 (II). **LABORATORY PROJECTS.**
Investigation and report on an elementary problem. Prerequisites, Chemical Engineering 256 and 257. 2 3-hour laboratory periods. *Credit, 2.*

388 (I). **OPTIMIZATION.**
Fundamental ideas and application of optimization techniques in operation and design. Topics include: extrema of functions, effect of constraints, LaGrange multipliers, introduction to linear programming, geometric programming and dynamic programming. Prerequisite, Math. 187. 3 class hours. *Credit, 3.*

389 (II). **OPTIMIZATION USING VARIATIONAL TECHNIQUES.**
The application of the calculus of variations, Pontryogine maximum principle, and dynamic programming to the design and control of chemical process equipment. Systems described by both ordinary and partial differential equations. Topics include: optimal reactor design, the synthesis of optimal control systems and optimal periodic operation of processing units. Prerequisite, Math. 187. 3 class hours. *Credit, 3.*

392 (II). **SEMINAR.**
Preparation and discussion of professional topics. Prerequisite, Chemical Engineering 256, 257. 2 class hours. *Credit, 2.*

Civil Engineering

Head of Department: Professor Merit P. White. Professors Archer, Berger, Boyer, Carver, Feng, Hendrickson, Heronemus, Marcus, Nash, Osgood, Weidmann; Associate Professors Adrian, Bembem, Chajes, Colonell, Dzialo, Grow, Higgins, Miller, Stockton; Visiting Associate Professor Ward; Assistant Professors Di Giano, Harris, Kuzminski, Webster.

SOPHOMORE YEAR	
<i>1st Semester</i>	<i>Credits</i>
Engl. 125, (1) Literature	3
Math. 173, Anal. Geom. and Calc. III	3
Phys. 162, General Physics	4
CE 101, Surveying	3
CE 140, Statics	3
	16
<i>2nd Semester</i>	
Engl. 126, (1) Literature	3
Math. 174, Anal. Geom. and Calc. IV	3
CE 180, Measurements and Anal.	3
CE 141, Strength of Materials	3
CE 257, Elementary Fluid Mech.	3
Economics (D)	3
	18

JUNIOR YEAR

1st Semester

Math. Elective (2)	3
CE 102, Transportation Location	3
CE 230, Theory of Structures	3
CE 280, Engineering Materials	3
CE 260, Engineering Hydraulics	3
CE 258, Fluid Mechanics Lab.	1

16

2nd Semester

CE 220, Soil Mechanics	3
CE 210, Transportation Systems	3
CE 270, Basic Environ. Engin.	4
CE 331, Design of Metal Struct.	3
CE 142, Dynamics	3

16

SENIOR YEAR

1st Semester

Science Elective (3)	3
CE 333, Reinforced Concr. Str.	3
Humanities Elective	3
Professional Electives (4)	6
Engl. 331, Technical Writing	2

17

2nd Semester

CE 396, Professional Problem	3
Social Science Elective	3
Professional Electives (4)	6
Free Elective	3

15

- (1) May be replaced by other approved literature courses.
- (2) Recommended: Math. 187, Math. 343, Math. 233, or CS 251
- (3) Recommended: Geology, Zoology, Biology, Microbiology.
- (4) Professional electives require department approval and must form a logical part of student's educational program.

Note that advanced ROTC study must be in addition to the normal load.

100 (I), (II). PLANE SURVEYING.

Taping, transit, level, stadia, topographic surveying and mapping, care and adjustment of instruments. (Not accepted for credit for Civil Engineering majors.) Prerequisite, Trigonometry. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

101 (I). SURVEYING.

Theory of surveying. Use, care and maintenance of tape, transit, and level; traverse computation; topographic surveying and mapping; property surveying. Prerequisite, Trigonometry. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

102 (I). TRANSPORTATION LOCATION.

Route location; horizontal and vertical alignment; construction computations. Prerequisite, Civil Engineering 101. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

140 (I), (II). STATICS.

Force systems, friction, first and second moments. Prerequisite, Integral Calculus concurrently. 3 class hours. *Credit, 3.*

141 (I), (II). STRENGTH OF MATERIALS I.

Simple and combined stresses and strains in tension, compression, and shear; torsion; stresses and deflections in beams. Prerequisite, Statics. 3 class hours. *Credit, 3.*

142 (II). DYNAMICS.

Motions of particles and rigid bodies and the force systems associated with these motions. Prerequisite, Statics. 3 class hours. *Credit, 3.*

180 (II). MEASUREMENTS AND ANALYSIS.

Introduction to engineering measurements and analysis, relating scientific principles to engineering applications. Prerequisites, Civil Engineering 141 and 257 concurrently, Physics and Chemistry. 1 class hour, 2 2-hour laboratories. *Credit, 3.*

210 (II). TRANSPORTATION SYSTEMS.

Planning, design and operation of highway and railroad systems. Computer methods used in conjunction with laboratory design and planning problems. Prerequisite, Civil Engineering 102. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

220 (II). SOIL MECHANICS.

Engineering uses and mechanical properties of soils. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

222 (I). SOIL TESTING.

Sampling and testing of soils for engineering purposes. Prerequisite, Civil Engineering 220. 1 class hour, 2 3-hour laboratory periods. *Credit, 3.*

230 (I). THEORY OF STRUCTURES I.

Analysis of statically determinate structures and structural elements. Prerequisite, Civil Engineering 141. 3 class hours. *Credit, 3.*

232 (I). THEORY OF STRUCTURES II.

Analysis of statically indeterminate structures. Prerequisite, Civil Engineering 230. 3 class hours. *Credit, 3.*

234 (II). THEORY OF STRUCTURES III.

Analysis of complex or special structures. Prerequisites, Civil Engineering 331, 232, 333 concurrently. 3 class hours. *Credit, 3.*

235 (I). MATRIX ANALYSIS OF STRUCTURES.

Development and use of the flexibility and stiffness methods of matrix analysis for determinate and indeterminate structures. (Formerly Civil Engineering 735.) Prerequisite, Civil Engineering 232. 3 class hours. *Credit, 3.*

240 (I). STRENGTH OF MATERIALS II.

Calculation of stresses and strains in components of machines and structures. Prerequisite, Civil Engineering 141. 3 class hours. *Credit, 3.*

256 (I). INTRODUCTION TO HYDRODYNAMICS.

Mathematical treatment of basic theorems of classical hydrodynamics including potential flow, conformal mapping, and wave and vortex motion. Prerequisite, Mathematics 186. 3 class hours. *Credit, 3.*

257 (II). ELEMENTARY FLUID MECHANICS.

Fundamentals of fluid mechanics including fluid properties, fluid behavior under static and dynamic conditions, and development of basic fluid flow equations. Prerequisite, Statics. 3 class hours. *Credit, 3.*

258 (I). FLUID MECHANICS LABORATORY.

Laboratory investigations of fluid mechanics principles, pipe and open channel flow, hydraulic machinery, and fluid measurements. Prerequisite, Civil Engineering 257. Corequisite, Civil Engineering 260. 1 2-hour laboratory. *Credit, 1.*

259 (II). ENGINEERING OCEANOGRAPHY.

Fluid mechanics problems of ocean and coastal engineering including currents, tides, surface waves, tsunami and seiche phenomena, and ocean circulation. Prerequisite, Civil Engineering 257. 3 class hours. *Credit, 3.*

260 (I). ENGINEERING HYDRAULICS.

Civil Engineering applications of fluid mechanics including analysis of water distribution and drainage systems, basic hydrology, fluid drag on structures, and hydraulic machinery. Prerequisite, Civil Engineering 257. 3 class hours. *Credit, 3.*

261 (I). OPEN CHANNEL FLOW.

Steady flow in open channels including channel transitions and controls, sediment transport, and elementary design of related hydraulic structures. Prerequisite, Civil Engineering 257. 3 class hours. *Credit, 3.*

270 (II). BASIC ENVIRONMENTAL ENGINEERING.

Quantity, quality and treatment of water and wastewater. Air pollution and solid waste problems. Prerequisites, Chem. 112; Civil Engineering 257 concurrently. 3 class hours, 1 3-hour laboratory period. *Credit, 4.*

271 (I). INTRODUCTION TO ENVIRONMENTAL POLLUTION CONTROL.

Basic engineering aspects of environmental pollution control. 3 class hours. (For students not majoring in Civil Engineering.) *Credit, 3.*

280 (I). ENGINEERING MATERIALS.

Emphasis on physical behavior and the correlation between experiment and theory. Prerequisite, Civil Engineering 141. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

281. MATERIALS IN THE OCEAN ENVIRONMENT.

Treatment of the response of structural materials to the ocean environment; theory of corrosion, abrasion, erosion, and biological attack. Prerequisite, permission of instructor. 3 class hours. *Credit, 3.*

285 (II). CONSTRUCTION PROBLEMS.

Legal aspects of construction contracts; estimating and bidding; critical path scheduling. 3 class hours. *Credit, 3.*

290. OCEAN ENGINEERING PAYLOAD DEVICES.

Techniques for augmentation of man's abilities in the sea. Underwater illumination, photography, manipulative and prosthetic devices, tools and instruments for underwater work. Prerequisite, permission of instructor. *Credit, 3.*

291. OCEAN SYSTEMS ENGINEERING AND DESIGN.

Systems engineering applied to synthesis of systems capable of doing useful work in the deep oceans. Emphasis on design of submergence vessels. Prerequisite, permission of instructor. 3 class hours, 1 3-hour laboratory period. *Credit, 4.*

305 (I). ADVANCED SURVEYING.

Elements of astronomical, geodetic and photogrammetric surveying; coordinate systems and map projections. Prerequisite, Civil Engineering 101. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

311 (II). TRAFFIC ENGINEERING.

Engineering solutions to planning, design, and operations problems of urban and rural street and highway networks. Prerequisite, Civil Engineering 210. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

321 (I). FOUNDATION ENGINEERING.

Foundations and earth structures; interpretation of borings; analysis and design of piles, footings, piers, abutments and retaining walls. Prerequisite, Civil Engineering 220. 3 class hours. *Credit, 3.*

323 (II). SOIL MECHANICS FOR TRANSPORTATION ENGINEERING.

Application of the principles of soil mechanics to the field of Transportation Engineering. Topics include the evaluation of the stability of soils as subgrade and embankment materials; the role of the subgrade properties of soils. Prerequisite, Civil Engineering 220. 3 class hours. *Credit, 3.*

331 (II). DESIGN OF METAL STRUCTURES.

Selecting and proportioning elements and connections of structural frames of buildings and bridges. Prerequisite, Civil Engineering 230. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

333 (I). **REINFORCED CONCRETE STRUCTURES.**
Analysis and design of reinforced concrete structures. Prerequisite, Civil Engineering 230. 3 class hours. *Credit, 3.*

334 (II). **ADVANCED TOPICS IN CONCRETE.**
Design of various types of reinforced concrete building frames; elastic theory and ultimate strength procedures. (Formerly Civil Engineering 773.) Prerequisites, Civil Engineering 232 and 333. 3 class hours. *Credit, 3.*

360 (I). **HYDROLOGY.**
The hydrologic cycle including precipitation, runoff, ground-water, flood routing, reservoir sedimentation, water law, and applications of hydrologic techniques to water resources engineering. Prerequisite, Civil Engineering 257 or permission of instructor. 3 class hours. *Credit, 3.*

362 (II). **WATER RESOURCES ENGINEERING.**
Planning and design of dams, reservoirs, and other related hydraulic structures, including analysis of existing and proposed water resources projects. Prerequisite, Civil Engineering 257 or permission of instructor. 3 class hours. *Credit, 3.*

365. **WATER INSTITUTIONS AND POLICIES.**
Public policies and laws relating to the use and conservation of water resources. Analysis of water-related governmental organization and programs at the Federal, state and local levels. Prerequisite, permission of instructor. 3 class hours. *Credit, 3.*

371 (II). **INDUSTRIAL WASTE TREATMENT AND CONTROL.**
Composition of industrial effluents; pollution criteria and effects of industrial wastes on receiving waters; physical, chemical and biological methods and applications in treatment. Prerequisite, permission of instructor. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

372 (I). **ENVIRONMENTAL ENGINEERING ANALYSIS I.**
Application of chemical principles to environmental engineering analysis with specific reference to pollution indices. Prerequisite, Chem. 112. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

373 (II). **ENVIRONMENTAL ENGINEERING ANALYSIS II.**
The fundamental microbiological and biochemical properties of the micro-organisms important in environmental engineering practice. Prerequisite, Civil Engineering 372 or permission of instructor. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

374. **RADIOLOGICAL HEALTH ENGINEERING.**
Basic principles and procedures pertaining to safe control of all common sources of ionizing radiation. Prerequisite, permission of instructor. 3 class hours. *Credit, 3.*

375 (II). **SURFACE WATER QUALITY CONTROL.**
Evaluation and control of water quality in streams, lakes and reservoirs. Mathematical analysis of patterns of water movement and their relation to water quality. 3 class hours. *Credit, 3.*

376 (I). **SOLID WASTES.**
The production, collection, transportation, treatment, and disposal of solid waste products (including municipal, industrial, and agricultural wastes). 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

385 (I), 386 (II). **CIVIL ENGINEERING PROJECT.**
Investigation of a problem or completion of a significant project. Prerequisite, permission of department. *Credit, 3.*

390 (II). **PROFESSIONAL SEMINAR.**
For seniors. Student reports on projects and professional aspects of Civil Engineering. 1 class hour. *Credit, 1.*

396 (II). **PROFESSIONAL PROBLEM.**
A problem relating to the student's area of interest in Civil Engineering is studied under the direction of a member of the faculty. May be a joint project with students from Civil Engineering or other departments. Oral and written reports required. Prerequisite, senior standing. *Credit, 3.*

Electrical Engineering

Head of Department: Professor G. Dale Sheckels. Professors Hutchinson, Langford, Lee, Monopoli, Navon, Seely; Associate Professors Bett, Edwards, Fitzgerald, Franks, Laestadius, Mohn, Scott, Tang, Thomas; Assistant Professors Bobrow, Ehrich, Gloriosio, Herchenreder, Jackson, McIntosh; Adjunct Professor Van Atta.

SOPHOMORE YEAR

<i>1st Semester</i>	<i>Credits</i>
English 125, Masterpieces of Western Literature*	3
Mathematics 173, Anal. Geom. and Calculus III	3
Physics 162, Gen. Physics II	4
EE 141, Systems Analysis I	4
MAE 135, Introduction to Materials Science	3
	17

<i>2nd Semester</i>	<i>Credits</i>
English 126, Masterpieces of Western Literature*	3
Mathematics 174, Anal. Geom. and Calculus IV	3
Physics 163, Gen. Physics III	4
EE 142, Systems Analysis II	4
EE 143, Introductory Laboratory	1
	15

JUNIOR YEAR

<i>1st Semester</i>	<i>Credits</i>
English 331, Technical Writing	2
EE 201, Electronic Materials and Devices	4
EE 257, Field Analysis I	4
EE 265, Random Signal Theory	3
Technical Elective	3
	16

*Students may substitute other University-approved courses for English 125 and 126.

<i>2nd Semester</i>	<i>Credits</i>
EE 202, Active Networks I	4
EE 204, Circuit Theory	3
EE 205, Intermediate Laboratory	2
EE 210, Digital Circuit Theory	3
EE 258, Field Analysis II	4
	16

SENIOR YEAR

<i>1st Semester</i>	<i>Credits</i>
EE 275, Advanced Laboratory	2
EE 394, Professional Seminar	1
Technical Elective	3
Technical Elective	3
Social Science Elective (D)	3
Humanity Elective (C)	3
	15

<i>2nd Semester</i>	<i>Credits</i>
EE 276, Advanced Laboratory	3
Technical Elective	3
Technical Elective	3
Social Science Elective (D)	3
Free Elective	3
	15

All elective courses listed in the above curriculum must be satisfied and must be approved by the adviser. Advanced Military or Air Science may be used for the Free Elective.

141 (I). SYSTEMS ANALYSIS I.
Physical characteristics and mathematical models of system elements; techniques for writing and solving system dynamic equations. Prerequisite, Engr. 104 and Math 124. 3 class hours. 1 3-hour problem period. *Credit, 4.*

142 (II). SYSTEMS ANALYSIS II.
Concepts relating to transfer functions; digital and analog solutions of system equations, time and frequency domain analysis techniques and stability. Prerequisite, EE 141. 3 class hours. 1 3-hour problem period. *Credit, 4.*

143 (III). INTRODUCTORY LABORATORY.
Laboratory techniques in circuits and systems appropriate to the level of sophomore engineers. Corequisite EE 142. 1 3-hour laboratory period. *Credit, 1.*

201 (I). ELECTRONIC MATERIALS AND DEVICES.
Introduction to quantum theory of solids and quantum statistics, conduction processes in semiconductors and metals, theory of p-n junction diodes and transistors, field effect diode. Prerequisites, Physics 163, MAE 135. 4 class hours. *Credit, 4.*

202 (II). ACTIVE NETWORKS. I.
Active network theory, emission, biasing, devise models and linear equivalent circuits, tuned and untuned amplifiers, power amplifiers, feedback switching mode applications, interfacing and integrated circuits. Prerequisites, EE 142, 201. 4 class hours. *Credit, 4.*

203 (I). ACTIVE NETWORKS II.
Feedback amplifier and oscillators, band-pass amplifiers, mixing and frequency conversion, modulation and demodulation, noise, active filters, electronic instrumentation and systems, power supplies and regulators. Prerequisite, EE 202. 3 class hours. *Credit, 3.*

204 (II). CIRCUIT THEORY.
Concepts used in the analysis of electrical circuits and systems: Fourier transforms, amplitude and phase responses, elementary synthesis, introduction to non-linear and time-varying networks. Prerequisite, EE 142. 3 class hours. *Credit, 3.*

205 (II). INTERMEDIATE LABORATORY.
Laboratory techniques pertaining to electrical circuit theory, active network analysis and digital circuits appropriate to a junior year competence in electrical engineering. Prerequisite, junior standing. 2 3-hour laboratory periods. *Credit, 2.*

210 (II). DIGITAL CIRCUIT THEORY.
An introduction to the theory of digital circuits stressing general techniques for the analysis and synthesis of combinational and sequential logic systems. Prerequisite, junior standing. 3 class hours. *Credit, 3.*

241. (I). ENERGY CONVERSION I.
Electromechanical energy conversion. Dynamical systems analysis of incremental motion transducers and rotary energy converters. Prerequisites, EE 142, 257. 3 class hours. *Credit, 3.*

243 (II). ENERGY CONVERSION II.
Direct energy conversion. Batteries, fuel cells, thermoelectric, photovoltaic, thermionic and MHD generators. Prerequisite, EE 201. 3 class hours. *Credit, 3.*

257 (I). FIELD ANALYSIS I.
Vector calculus. Conservative and non-conservative fields. Static and time-varying electromagnetic fields. Maxwell's equations, relations between field and circuit theory. Prerequisites, Physics 163, Math. 174. 4 class hours. *Credit, 4.*

258 (II). FIELD ANALYSIS II.
Continuation of EE 257 with special emphasis on time varying electromagnetic fields and wave phenomena. Prerequisite, EE 257. 4 class hours. *Credit, 4.*

265 (I). RANDOM SIGNAL THEORY.
Introduction to probability and stochastic processes. Correlation theory and its application to electrical engineering problems in communication and control systems. Prerequisite, EE 142. 3 class hours. *Credit, 3.*

266 (I). SIGNAL PROCESSING AND COMMUNICATION SYSTEMS I.

Principles of design of modern communication systems. Mathematical description of digital and analog signals. Basic limitations of modulation techniques and information capacity of transmission systems. Prerequisite, EE 142. 3 class hours. *Credit, 3.*

267 (II). SIGNAL PROCESSING AND COMMUNICATION SYSTEMS II.

Techniques for evaluating performance of modulation and information transmission systems. Extraction of signals from noise. Minimum error signal estimation and detection. Prerequisites, EE 265, 266, or consent of instructor. 3 class hours. *Credit, 3.*

270 (I). SOLID STATE DEVICES.

Review of transistor physics, recombination statistics, avalanche and tunneling phenomena, varactor diodes, Schottky diodes, thyristors, tunnel diodes, junction and MOS field-effect devices, p-n junction lasers. Prerequisite, EE 201. 3 class hours. *Credit, 3.*

271 (II). MICROELECTRONICS.

Principles and applications of microelectronics with particular emphasis on silicon monolithic integrated circuits. Fundamental limitations of microminiaturization, design constraints imposed by the monolithic technique, planar technology, digital and linear microcircuits. Prerequisite, EE 201. 3 class hours. *Credit, 3.*

275 (I). ADVANCED LABORATORY I.

Projects designed to provide the student with laboratory experience related to his technical electives. Prerequisite, senior standing. 2 3-hour laboratory periods. *Credit, 2.*

276 (II). ADVANCED LABORATORY II.

Laboratory techniques developed in EE 275 are used to carry out a concentrated study in the student's area of interest. Prerequisite, EE 275. 2 4-hour laboratory periods. *Credit, 3.*

278 (I). DIGITAL SYSTEMS DESIGN.

The design of a digital system by the interface of subunits described in terms of register sets. The subunits are interfaced at the architectural level by a set of instructions and at the logic level by the Boolean equations derived from the corresponding register transfers. Prerequisite, EE 210. 3 class hours. *Credit, 3.*

286 (II). POWER SYSTEM ANALYSIS.

Power transfer diagrams, voltage studies, system stability criteria, short-circuit calculations, and protective methods. Prerequisite, EE 241. 3 class hours. *Credit, 3.*

287 (II). MARINE INSTRUMENTATION.

A survey of the oceanographic parameters of interest to ocean engineers; the theory of measurement for those parameters. Typical examples of existing measuring equipment. 3 class hours. *Credit, 3.*

288 (II). PULSE ELECTRONICS.

Analysis and design of circuits for the generation, transmission and processing of information by means of pulses. Prerequisite, EE 202. 3 class hours. *Credit, 3.*

290 (I). FEEDBACK CONTROL SYSTEMS I.

Time domain and frequency domain analysis and synthesis techniques for linear continuous control systems. The relationships between these techniques. Prerequisites, EE 142 or permission of instructor. 3 class hours. *Credit, 3.*

291 (II). FEEDBACK CONTROL SYSTEMS II.

Analysis of nonlinear continuous control systems; introduction to digital control systems and optimization techniques. Prerequisite, EE 290. 3 class hours. *Credit, 3.*

294 (I). MICROWAVE ENGINEERING I.

Electromagnetic theory applied to microwave propagation in waveguides and coaxial lines. Microwave circuit theory with applications to passive microwave networks. Prerequisite, EE 258. 3 class hours. *Credit, 3.*

295 (II). MICROWAVE ENGINEERING II.

Continuation of EE 294. Modern microwave components including filters, ferrite devices, multiport junctions, amplifiers and oscillators. Generation, radiation and detection of microwaves. Prerequisite, EE 294. 3 class hours. *Credit, 3.*

298 (I). BIOMEDICAL ENGINEERING I.

Techniques and concepts from control and communication theory useful in biological, medical and psycho-physical research. Prerequisite, permission of instructor. 3 class hours. *Credit, 3.*

299 (II). BIOMEDICAL ENGINEERING II.

Engineering analysis of the visual, position-motion sensing, taste and smell biological communication channels; human tracking capabilities; analog and hybrid modeling. Prerequisite: EE 298. 3 class hours. *Credit, 3.*

306 (I). ACOUSTICS.

The fundamentals of sound generation, propagation and detection. Applications of theory to underwater sound and human speech. Prerequisite, junior standing or consent of instructor. 3 class hours. *Credit, 3.*

311 (II). APPLIED NONLINEAR ANALYSIS.

The analysis of nonlinear mechanical and electrical systems. Numerical, graphical and analytical methods used to determine the behavior of modern nonlinear devices. Prerequisite: Math 174. 3 class hours. *Credit, 3.*

385 (I), 386 (II). SPECIAL PROBLEMS.

An individual investigation carried out under the supervision of an interested staff member, or a class study of recent advances and current problems in a specialized field. Prerequisite, permission of instructor. *Credit 1-4.*

394 (I). PROFESSIONAL SEMINAR.

Current engineering developments discussed through student reports. Instruction is given in the preparation of papers for publication and their presentation before technical audiences. Prerequisite, senior standing. 1 class hour. *Credit, 1.*

Industrial Engineering

Head of Department: Professor Richard W. Trueswell; Professors Corlett (Visiting), Miser, Rising; Associate Professors Davis, Giglio, Kaminsky, Kroner; Assistant Professor Rikkers.

SOPHOMORE YEAR

1st Semester	Credits
English 125, Masterpieces of Western Literature	3
Physics 162, General Physics II	4
Mathematics 173, Analytic Geometry and Calculus III	3
I.E. 151, Problems and Model Formulation	3
Humanities or Social Science Elective	3
	16
2nd Semester	
English 126, Masterpieces of Western Literature	3
Physics 163, General Physics III	4
Economics 125, Elements of Economics	3
Mathematics 174, Analytic Geometry and Calculus IV	3
I.E. 271, Basic Probability for Engineers	3
English 331, Technical Writing	2
	18

JUNIOR YEAR

1st Semester	
I.E. 272, Principles of Engineering Statistics	3
I.E. 379, Operations Research I	3
I.E. 353, I.E. Economics I	3
Mathematics 115, Linear Algebra	3
Electives*	6
	18
2nd Semester	
I.E. 273, Simulation	3
I.E. 380, Operations Research II	3
I. E. 354, I.E. Economics II	3
Electives*	3
I.E. 260, Design of Man Machine Systems I	3
	15

SENIOR YEAR

1st Semester	Credits
I.E. 378, Production Control	3
I.E. 261, Design of Man Machine Systems II	3
Economics Elective	3
Humanities or Social Science Elective	3
Electives*	6
	18
2nd Semester	
Social Science Elective	3
Electives*	12
	15

*These 27 credit hours of electives must satisfy the following: twelve from any courses offered for credit in the University, nine in recognized engineering science courses (must include a sequence of at least two courses) and six in Industrial Engineering and/or engineering science.

151. PROBLEMS AND MODEL FORMULATION.
Introduction to Industrial Engineering (IE) and Operations Research (OR). Describes practical problems that arise in these fields, and shows how theoretical models have been developed to help with their solutions. An introductory survey to the main currents of IE and OR developed further in later courses; insights into the varied pursuits of professionals in these fields. *Credit, 3.*

253. METHODS AND STANDARDS ENGINEERING.
The principles involved in the simplification of the work pattern and the design of the work place, and in the establishment of production standards. Prerequisite, I.E. 271, previously or concurrently. 3 class hours, 1 3-hour laboratory period. *Credit, 4.*

256. DATA PROCESSING AND INFORMATION HANDLING SYSTEMS.
Principles and applications of data processing and electronic computer systems for use by Industrial Engineers as a management tool for control and decision-making. Prerequisite, permission of instructor. *Credit, 3.*

260. DESIGN OF MAN MACHINE SYSTEMS I.
Structure and behavior of man; energy, effort and movement; analysis and design of work layout; and measurement of performance. 2 class hours, 1 2-hour laboratory period. *Credit, 3.*

261. DESIGN OF MAN MACHINE SYSTEMS II.
Man as a system component; perception, decision and control; plant design and operation; training and job design. Prerequisites, I.E. 260, 272. 2 class hours, 1 2-hour laboratory period. *Credit, 3.*

271. BASIC PROBABILITY FOR ENGINEERS.
A basic study of probability theory including: sample spaces; discrete and continuous random variables; functions of random variables; marginal and joint probability; density and cumulative distribution functions; and moments. Prerequisite, Math. 124. *Credit, 3.*

272. PRINCIPLES OF STATISTICAL STATISTICS.

Statistical principles as applied to engineering problems including: estimation, hypothesis testing, analysis of variance, design of experiments, sampling plans, statistical quality control. Prerequisite, I.E. 271. *Credit, 3.*

273. INTRODUCTION TO SIMULATION METHODS

(Also listed as GB 273).

Introduction to the principles and methods of computer simulation. Each student constructs, tests, and runs a complex simulation model. Prerequisite, I.E. 271. *Credit, 3.*

286. INDUSTRIAL ENGINEERING PRINCIPLES.

Organization, plant location, plant layout, industrial costs, production control, production standards, incentives. For students other than Industrial Engineering majors. Prerequisite, Junior standing. 3 class hours. *Credit, 3.*

288. MOTION AND TIME STUDY.

For junior and senior students outside the industrial engineering field. Prerequisite, Junior standing. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

341. HOSPITAL INDUSTRIAL ENGINEERING I.

An introductory course in the application of Industrial Engineering techniques to hospital management. Emphasis will be placed on the institution of Industrial Engineering programs in hospitals and the choice of suitable projects. Guest lecturers. *Credit, 3.*

342. HOSPITAL INDUSTRIAL ENGINEERING II.

A projects course based upon material covered in I.E. 341. Study of previous Industrial Engineering projects in hospitals; subsequently each student is expected to conduct a project of his own in a local hospital. Prerequisite, I.E. 341. *Credit, 3.*

353, 354. INDUSTRIAL ENGINEERING ECONOMICS I-II.

An introduction to economic problems faced by the industrial engineer: comparison of alternatives in engineering projects, breakeven and minimum cost points, and economic selection and replacement of structures and machines. Decisions made in the face of risk and uncertainty discussed extensively. Instruction wherever advantageous by the case method. Either course may be taken separately. Prerequisite, I.E. 272. *Credit, 3 each semester.*

360. SAFETY ENGINEERING.

Design of equipment facilities and processes to minimize accidents. Evaluation and design of fire prevention equipment and accident control procedures in organizations. *Credit, 2.*

375. JOB EVALUATION.

The principles used to determine an evaluation of all occupations in order to establish an equitable rating between them, to establish sound wage and salary policies. Prerequisite, I.E. 151. *Credit, 2.*

376. TIME STUDY.

Principles involved in the establishment of production standards and their application in the management functions of cost ac-

counting, estimating, production control incentives, budgetary control. Prerequisite, I.E. 151 concurrently except for Business Administration majors. *Credit, 3.*

377. LAYOUT AND DESIGN OF ORGANIZATIONAL FACILITIES.

Principles applying to the determination and development of the physical relationship between plant equipment and operators considering the economy and effectiveness of operation. Prerequisites, MAE 102, and I.E. 151, or equivalents. 1 class hour, 1 3-hour laboratory period. *Credit, 2.*

378. PRODUCTION PLANNING AND CONTROL.

Principles and methods used to regulate production activities in keeping with the manufacturing plan. Prerequisites, I.E. 151, 272, 379. *Credit, 3.*

379. OPERATIONS RESEARCH I.

The theory and application of quantitative decision making techniques to a wide variety of planning and operational problems. Examples from industrial and governmental settings. Methodology of deterministic modeling: classical optimization, linear programming, dynamic programming, search techniques, and combinatorial problems. Credit not allowed students who have taken Management 253, 254. Prerequisite, calculus. *Credit, 3.*

380. OPERATIONS RESEARCH II.

Stochastic models: decision theory, game theory, queueing theory, inventory theory, and general Markov processes. Credit not allowed students who have taken Management 253, 254. Prerequisites, I.E. 271, 379. *Credit, 3.*

382. WORK SIMPLIFICATION.

The principles involved in the simplification of means of doing work and in the application and use of these principles. Prerequisites, MAE 268, and I.E. 376 concurrently. 1 class hour. 1 3-hour laboratory period. *Credit, 2.*

385 (I), 386 (II). INDUSTRIAL ENGINEERING PROJECTS.

Work for a senior thesis or a special program. Admission by permission of instructor. *Credit, 1-3.*

394. PROFESSIONAL SEMINAR.

Presentation of papers on important subjects and recent developments. Prerequisite, Senior standing. 1 class hour. *Credit, 1.*

Mechanical and Aero-space Engineering

Head of Department: Professor John R. Dixon. Professors Bates, Boothroyd, Crossley, Day, Dittfach, Horvay, Murthy, Zahradnik; Associate Professors Costa, Fillo, McLennan, O'Byrne, Patterson, Poli, Ritter, Zinsmeister; Assistant Professors Ambs, Cromack, Kirchhoff, Mani, McGowan, Nelson, Russell, Umholtz; Instructor Budynas; Visiting Associate Professor Redford.

MECHANICAL ENGINEERING

SOPHOMORE YEAR

<i>1st Semester</i>	<i>Credits</i>
English 125	3
Mathematics 173	3
Physics 162	4
MAE 135, Intro. to Materials Science	3
MAE 137, Intro. to Materials Science Lab.	1
MAE 144, Mechanics I	3
	17

<i>2nd Semester</i>	
English 126	3
Mathematics 174	3
Physics 163	4
MAE 145, Mechanics II	3
MAE 163, Thermodynamics I	3
	16

JUNIOR YEAR

<i>1st Semester</i>	
MAE 267, MAE Lab. I	3
MAE 246, Mechanics III	3
MAE 265, Fluid Mechanics	3
EE 141, Circuits I	4
MAE 284, MAE Analysis I	3
	16

<i>2nd Semester</i>	
MAE 264, Thermodynamics II	3
EE 142, Circuits II	4
MAE 235, Materials and Manufacturing	3
MAE 237, Materials and Manufacturing Lab.	1
MAE 293, M.E. Design	4
	15

SENIOR YEAR

<i>1st Semester</i>	
MAE 279, MAE Lab. II	1
MAE 294, MAE Systems Analysis or	
MAE 291, MAE Analysis II	3
Social Science Elective	3
Humanities Elective	3
Technical Elective	3
Technical Elective	3
	16

2nd Semester

MAE 280, MAE Lab. III	2
Social Science Elective	3
Mathematics Elective	3
Technical Elective	3
Technical Elective	3
MAE 295, MAE Design	3
	17

Credits

MECHANICAL ENGINEERING

Materials Major

SOPHOMORE YEAR

<i>1st Semester</i>	
English 125	3
Mathematics 173	3
Physics 162	4
MAE 135, Intro. to Materials Science	3
MAE 137, Intro. to Materials Sci. Lab.	1
MAE 144, Mechanics I	3
	17

<i>2nd Semester</i>	
English 126	3
Mathematics 174	3
Physics 163	4
MAE 145, Mechanics II	3
MAE 163, Thermodynamics I	3
	16

JUNIOR YEAR

<i>1st Semester</i>	
MAE 288, Physics of Solids	3
MAE 267, MAE Lab. I	3
MAE 246, Mechanics III	3
MAE 265, Fluid Mechanics	3
Chem. 285, Physical Chemistry	3
	15

<i>2nd Semester</i>	
MAE 264, Thermodynamics II	3
MAE 235, Materials and Manufacturing	3
MAE 237, Materials and Manufacturing	1
Chem. 160, Organic Chemistry	4
Technical Elective	3
Social Science Elective	3
	17

SENIOR YEAR

1st Semester	Credits
MAE 308, Phys. Met. Principles	3
Chem. 501, Polymer Science	3
MAE 279, MAE Lab. II	1
MAE 220, Materials Processing	3
Mathematics Elective	3
Technical Elective	3
	16

2nd Semester	Credits
MAE 350, X-Ray Diffraction	3
MAE 280, MAE Lab. III	2
Social Science Elective	3
Humanities Elective	3
Technical Elective	3
Technical Elective	3
	17

AERO-SPACE ENGINEERING

SOPHOMORE YEAR

1st Semester	Credits
English 125	3
Mathematics 173	3
Physics 162	4
MAE 135, Intro. to Materials Science	3
MAE 137, Intro. to Materials Sci. Lab.	1
MAE 144, Mechanics I	3
	17

2nd Semester	Credits
English 126	3
Mathematics 174	3
Physics 163	4
MAE 145, Mechanics II	3
MAE 163, Thermodynamics I	3
	16

JUNIOR YEAR

1st Semester	Credits
MAE 267, MAE Lab. I	3
MAE 246, Mechanics III	3
MAE 265, Fluid Mechanics	3
EE 141, Circuits I	4
MAE 284, MAE Analysis I	3
	16

2nd Semester	Credits
MAE 264, Thermodynamics II	3
EE 142, Circuits II	4
MAE 270, Astrodynamics	3
MAE 248, Aero-space Structures	3
Humanities Elective	3
	16

SENIOR YEAR

1st Semester	Credits
Social Science Elective	3
MAE 287, Gas Dynamics	3
MAE 279, MAE Lab. II	1
Technical Elective	3
MAE 274, Flight Vehicle Performance	3
MAE 294, MAE System Analysis	3
	16

2nd Semester	Credits
Social Science Elective	3
MAE 280, MAE Lab. III	2
MAE 295, MAE Design	3
MAE 278, Aero-space Propulsion	3
Technical Elective	3
Mathematics Elective	3
	17

SUPPLEMENTARY RULES AND PROCEDURES

- Honors**—Sophomore, Junior, or Senior students who are selected for their outstanding performance by the Undergraduate Committee are eligible to participate in the Department's Honors program. Curriculum, other than School and University requirements, is completely open subject to the approval of the Honors Adviser, the Undergraduate Committee and Department Head. It is expected that Honors students will cover the Departmental core material but not necessarily by taking the regularly specified courses. Special Departmental recognition will be extended to the Honors students.
- ROTC**—No ROTC credits are acceptable in fulfillment of the 128 credit hour degree requirements of the Department.
- Non-Technical Electives**—Students may substitute one Non-Technical Elective for a Technical Elective provided the student presents evidence in writing that such a substitution is beneficial to the planned program. The substitution must have the approval of the student's Adviser and the Department Head.

4. **Technical Electives**—Technical electives may be satisfied by upper level courses in Engineering, Mathematics, Computer Science, or Physics, or by upper or lower level courses in Chemistry or the Life Sciences.
5. **Mathematics Electives**—Mathematics electives may be satisfied by upper level Mathematics or Computer Science courses, or by Probability and Statistics in Industrial Engineering.
6. **Technical Communication**—Any student paper or report considered poor on the basis of technical communication by any instructor will be submitted to a Technical Communication Committee for review, comment, and recording. Such reports will be required to be redone. Students who show consistently poor communications performance may be required by the Committee to take a course in Technical Writing in their senior year.

135 (I). INTRODUCTION TO MATERIALS SCIENCE.

The atomic and molecular phenomena responsible for the behavior of materials. The relationship between the atomic structure of materials and their behavior is emphasized. Prerequisite, Chemistry 112 or 114. 3 class hours. *Credit, 3.*

137 (I). INTRODUCTION TO MATERIALS SCIENCE LABORATORY.

Laboratory work to illustrate the concepts and principles of materials science. Prerequisite, MAE 135 concurrently. 1 3-hour laboratory period. *Credit, 1.*

144. (I), (II). MECHANICS I.

Elements of statics and strength of materials. Prerequisite, integral calculus concurrently, Physics 161. 3 class hours. *Credit, 3.*

145 (I), (II). MECHANICS II.

Continuation of strength of materials; elementary kinematics of mechanisms and dynamics of particles and rigid bodies. Prerequisite, MAE 144. 3 class hours. *Credit, 3.*

163 (II). THERMODYNAMICS.

The laws of thermodynamics are introduced and applied to various energy-transforming devices. Property relations. Emphasis on the science of thermodynamics, providing a background for further study in those areas that involve thermodynamic principles. Prerequisites, Physics 162, Mathematics 173. 3 class hours. *Credit, 3.*

220 (I). MATERIALS PROCESSING.

Analysis of the metal cutting process including: mechanics of metal cutting; temperature generated; tool life and tool wear; cutting fluids and surface roughness; economics. The grinding process and electrical machining process. Analysis of metal forming processes including wire drawing, extrusion, deep drawing, rolling, blanking. Prerequisite, senior standing. 3 class hours. *Credit, 3.*

221 (II). AUTOMATION IN MANUFACTURING.

Fundamentals of parts feeding, orientation and mechanized assembly including analyses of transfer machines parts feeders; the performance and economics of assembly machines. Numerical control of machine tools including studies of control systems, planning procedures and economics. Prerequisite, senior standing. 3 class hours. *Credit, 3.*

235 (II). MATERIALS AND MANUFACTURING.

The mechanical behavior of materials. Dislocations, material failures, creep, fatigue. Processing materials by plastic deformation and machining. Friction, lubrication, and wear. Casting and joining processes. Prerequisites, MAE 135 and 145. 3 class hours. *Credit, 3.*

237 (II). MATERIALS AND MANUFACTURING LABORATORY. Laboratory work associated with MAE 235. Prerequisite, MAE 235 concurrently. 1 3-hour laboratory period. *Credit, 1.*

246 (I), (II). MECHANICS III.

Advanced topics in dynamics and strength of materials. Prerequisite, MAE 144. 3 class hours. *Credit, 3.*

248. AERO-SPACE STRUCTURES.

Flight loads, aerodynamic heating, thermal effects in flight structures, analysis and design of structural components of flight vehicles, hypersonic flight vehicles structures. Prerequisite, MAE 145. 3 class hours. *Credit, 3.*

254 (I). PRODUCT DESIGN I.

Human values in design. Central philosophy of product design, with emphasis on the relation between technical and human values, creativity, and design methodology. Laboratory includes the development of simple product concepts visualized in rapidly developed three-dimensional mockups. 2 class hours, 2 2-hour laboratory periods. *Credit, 3.*

257 (II). PRODUCT DESIGN II.

Continuation of MAE 254, Product Design I. 2 class hours, 2 2-hour laboratory periods. *Credit, 3.*

264 (II). THERMODYNAMICS II.

Application of the laws of thermodynamics to energy conversion devices. Introduction to irreversible thermodynamics. Prerequisite, MAE 163. 3 class hours. *Credit, 3.*

265 (I). FLUID MECHANICS.

Vector approach to the fundamentals of fluid dynamics, including the topics of fluid statics, kinematics of fluids, potential flow, vorticity, dimensional analysis. Introduction to viscous fluids and compressibility. Prerequisite, MAE 163. 3 class hours. *Credit, 3.*

267 (I). MECHANICAL AND AERO-SPACE ENGINEERING LABORATORY I.

Calibration and application of instruments used in the testing of mechanical engineering apparatus. Introduction to the theory of experimentation. Prerequisite, MAE 163. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

268 (II). KINEMATICS.

Mechanism, including velocity and acceleration diagrams, instant centers, gear teeth and gear trains, cams, and various speed transmissions. Prerequisite, MAE 246. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

270 (II). ASTRODYNAMICS.

Introduction to the theory of flight of artificial satellites, and ballistic missiles. The two-body problem. Elliptic, parabolic, and hyperbolic orbits. Transfer orbits, rendezvous, and intercept. Lunar and interplanetary trajectories. Free flight of a ballistic missile. Re-entry. Introduction to perturbation theory. Prerequisite, MAE 246. 3 class hours. *Credit, 3.*

274 (I). FLIGHT VEHICLE PERFORMANCE.

Theoretical and experimental aspects of lift and drag of flight vehicles viewed as a system. Static and maneuvering performance analysis. Theory and design of control surfaces. Introduction to stability and control. Prerequisite, MAE 287. 3 class hours. *Credit, 3.*

276 (II). COMBUSTION.

Phenomenological study of combustion processes in flowing systems. Prerequisite, MAE 264. 3 class hours. *Credit, 3.*

277 (I). INTRODUCTION TO PROPULSION POWER PLANTS.

Thermodynamic and performance aspects of reciprocating gasoline and diesel engines. Prerequisite, MAE 264. 3 class hours. *Credit, 3.*

278 (II). AERO-SPACE PROPULSION.

Primary and auxiliary power sources. Matching of air-breathing and rocket motor with vehicle. Electrical and nuclear propulsion systems. Prerequisite, MAE 287. 3 class hours. *Credit, 3.*

279 (I). MECHANICAL AND AERO-SPACE ENGINEERING LABORATORY II.

The theory and design of complete engineering experiments. Analog computer techniques. Prerequisite, MAE 267. 1 3-hour laboratory period. *Credit, 1.*

280 (II). MECHANICAL AND AERO-SPACE ENGINEERING LABORATORY III.

The conception, design, fabrication, and test of an engineering experiment. Prerequisite, MAE 279. 2 3-hour laboratory periods. *Credit, 2.*

282 (II). HEAT TRANSFER.

Conduction, convection and radiation, with engineering applications. Prerequisites, MAE 163; Mathematics 174 or 241. 3 class hours. *Credit, 3.*

283 (I). MACHINE DESIGN.

Principles of the design of various machine parts; economy of manufacture, safety, styling, invention and creativity. Prerequisites, MAE 235, 237, and 293. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

284 (II). MECHANICAL AND AERO-SPACE ENGINEERING ANALYSIS I.

Engineering problem solving emphasizing problem recognition and formulation, simplifying assumptions, and valid analytical

processes. Prerequisite, Mathematics 174. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

285 (I). VIBRATIONS I.

Elements of vibration theory, vibration isolation, absorbers, instrumentation, analysis of equivalent masses and shaft systems. Dynamic balancing. Prerequisite, MAE 246. 3 class hours. *Credit, 3.*

286 (II). ADVANCED MACHINE DESIGN.

Continuation of course 283. Additional elementary parts are analyzed and some complete machines studied. Emphasis on invention and creativity. Prerequisite, MAE 283. 2 class hours, 1 3-hour laboratory period. *Credit, 3.*

287 (I). GAS DYNAMICS.

Continuous and discrete media. Compressible flow equations and compressibility effects. Flow in variable area ducts, normal and oblique shocks. Two dimensional flow. Applications. Prerequisites, MAE 163 and 265. 3 class hours. *Credit, 4.*

288 (I). PHYSICS OF SOLIDS.

Mechanical, electrical, magnetic and thermal properties of engineering materials. Prerequisites, Chemistry 112 or 114, Physics 162 or 125 or their equivalents. 3 class hours. *Credit, 3.*

291 (I). MECHANICAL AND AERO-SPACE ENGINEERING ANALYSIS II.

Continuation of MAE 284 with emphasis on more complex problems and more advanced mathematical methods. Prerequisite, MAE 284. 3 class hours. *Credit, 3.*

293 (II). MECHANICAL ENGINEERING DESIGN.

Introduction to the engineering design process, inventiveness, optimization, and decision-making. Prerequisite, MAE 284. 3 class hours, 1 3-hour laboratory period. *Credit, 4.*

294. MECHANICAL AND AERO-SPACE SYSTEMS ANALYSIS.

Application of engineering analysis techniques to large scale systems. Concepts and methodology of systems engineering. Prerequisite, EE 142 or permission of instructor. 3 class hours. *Credit, 3.*

295 (II). MECHANICAL AND AERO-SPACE ENGINEERING DESIGN.

Application of fundamentals and technology to complex design projects. Prerequisite, senior standing. 1 class hour, 2 3-hour laboratory periods. *Credit, 3.*

301 (I). ADVANCED ENGINEERING ANALYSIS AND DESIGN I.

An integration of fundamental physical laws with mathematical theory. Utilization of physical principles in a rigorous study of analysis and design methods in engineering. Application of graphical, numerical, and mathematical methods to realistic problems is emphasized. Prerequisite, graduate standing or permission of instructor. 3 class hours. *Credit, 3.*

303 (I). THERMODYNAMICS.
 Review of classical thermodynamics and conventional energy conversion. Statistical thermodynamics. Introduction to irreversible thermodynamics and direct energy conversion. Prerequisite, graduate standing or permission of instructor. 3 class hours. *Credit, 3.*

305 (II). CONTINUUM ANALYSIS.
 A unified treatment of the analysis of continua. Consideration of continuity, thermal and mechanical energy, entropy production, stress, strain, equations of motion, rotation, rate of strain and vorticity. Application to thermodynamics, fluid dynamics, heat conduction and convection, elasticity, and thermoelasticity. Prerequisite, graduate standing or permission of instructor. 3 class hours. *Credit, 3.*

306. ADVANCED FLUID MECHANICS.
 Review of kinematics of fluids and fluid dynamics; inviscid fluids; viscous fluid dynamics; incompressible, laminar flows; introduction to boundary layer theory. Prerequisite, MAE 265 or equivalent. 3 class hours. *Credit, 3.*

307 (I). ADVANCED DYNAMICS.
 Advanced dynamics of particles, systems of particles, variable mass systems, and rigid bodies. Gyroscopic motion. Rotating and

accelerating frames of reference. Use of energy methods, Lagrange's equations, Hamilton's principle, and Eulerian angles in engineering problems. Prerequisite, graduate standing or permission of instructor. 3 class hours. *Credit, 3.*

308 (I). PHYSICAL METALLURGY PRINCIPLES.
 Principles underlying the structure and behavior of metals. Atomic arrangements crystalline imperfections and X-ray. Equilibrium and non-equilibrium phase relationships in one-, two-, and three-component systems. Kinetics of diffusion and nucleation. Phase transformations, heat treatment and hardenability. Prerequisite, graduate standing or permission of instructor. 3 class hours. *Credit, 3.*

350 (II). X-RAY DIFFRACTION.
 Principles of crystallography. X-ray diffraction. Prerequisite, MAE 308. 3 class hours. *Credit, 3.*

385 (I), 386 (II). SPECIAL TOPICS.
 Special study or project work leading to a written or oral report. Admission by permission of instructor. May be repeated for credit. *Credit, 3.*

School of Home Economics

HELEN G. CANOYER, *Dean*
 Christine H. Hillman, *Assistant Dean*

Winifred I. Eastwood,
Director, Head of Extension Division
for Home Economics

Nutrition and Food

Head of Department: Assistant Professor Mark H. Bert.
Associate Professors D. Davis, Wright; *Assistant Professors* McCullough, Umapathy.

Credits

MAJOR IN DIETETICS AND INSTITUTIONAL ADMINISTRATION	
General Education	60
Home Economics Core	10
Pre-Professional	15
Professional	28
Electives	12
Physical Education	2
<i>Credits</i>	127
I. General Education	
English 111 and 112, Composition	4
English 125–126, 151–152, 153–154,	

Comparative Literature 201–202, French 161–162, German 277–278, Italian 161–162, Spanish 161–162	6
Speech 101, Oral Communication	2
Economics 125, Elements of	3
Sociology 101, Introductory	3
Psychology 101, General	3
History 100, 101, 150 or 151	3
Government 100, or Math 111	3
Chemistry 111 and 112, General	6
Chemistry 160, Organic	4
Biochemistry 220, Elementary Biochemistry	4
Zoology 101, Introductory	3
Zoology 135, Introductory Physiology	3
Microbiology 250, General	4
Accounting 125, Introduction to Accounting 1	3
Electives from the following Humanities:	3
Music, Art, Philosophy, Speech 201, or language	6

	Credits		Credits
II. Home Economics Core		161–162, German 277–278, Italian 161–162, Spanish 161–162	6
HEEd. 120, Introduction to Home Economics	1	Speech 101, Oral Communication	2
NF 127, Man and Nutrition	3	Speech 201, Public Speaking	3
Select two from the following core:		Elective from Humanities (C)	3
TCEA 141, Man and Clothing		Journalism 201 and 339, or Speech 222, 223, 224, or English 337, 339, or 345, 346 or 347	6
TCEA 123, Art for Living		Psychology 101, General	3
MFE 250, Family Management and Decision Making		Economics 125, Elements of	3
HD 380, Human Development in the Family	6	Sociology 101, Introductory	3
III. Pre-Professional		Elective from Humanities or Social Science	3
Management 214, Personnel Management	3	Chemistry 111 and 112, General	6
HEEd. 381, Adult Education In Home Economics, or Psych 301, Educational	3	Chemistry 160, Organic	4
Limited Electives from the following:		Biochemistry 220, Elementary Biochemistry	4
MFE 274, Consumer Attitudes and Demand		Zoology 101, Introductory	3
MFE 377, Theory and Application of Management		Zoology 135, Introductory Physiology	3
Public HI 123, Principles & Practices of Health Education		Microbiology 250, General	4
Pub HI 123, Principles & Practices of Health Education		II. Home Economics Core	
AFE 261, Food Marketing Systems		HEEd. 120, Introduction to Home Economics	1
AFE 265, Food Merchandising	9	NF 127, Man and Nutrition	3
IV. Professional		TCEA 141, Man and Clothing	3
NF 130, Meal Management	3	TCEA 123, Art for Living	3
NF 251, Principles of Food Preparation	3	MFE 250, Family Management and Decision Making	3
NF 352, Human Nutrition	3	HD 380, Human Development in the Family	3
NF 375, Nutrition in Disease	3	III. Pre-Professional	
NF 350, Quantity Food Management	4	Marketing 201, Fundamentals of Marketing	3
NF 351, Institutional Administration	4	Marketing 222, Marketing Communications	3
NF 360, Experimental Foods	3	Limited Elective from the following:	
NF 372, Quantity Food Purchasing	3	AFE 261, Food Marketing Systems	
NF 390, Seminar in Foods	1	AFE 265, Food Merchandising	
NF 391, Seminar in Nutrition	1	AFE 368, Food Distribution Economics	
V. Electives	12	MFE 260, Household Equipment	
MAJOR IN FOODS IN BUSINESS		MFE 275, Personal and Family Economics	
General Education	60	Marketing 216, Marketing Management	
Home Economics Core	16	Marketing 221, Prod. Planning and Development	
Pre-Professional	9	Marketing 223, Marketing Network Analysis	
Professional	30	Marketing 224, Analysis of Pricing Decisions	3
Electives	10	IV. Professional	
Physical Education	2	NF 130, Meal Management	3
Credits	127	NF 251, Principles of Food Preparation	3
I. General Education		NF 352, Human Nutrition	3
English 111 and 112, Composition	4	HEEd. 261, Communication by Demonstration Methods	3
English 125–126, 151–152, 153–154, Comparative Literature 201–202, French		FS & T 384, Sensory Evaluation Methods	2
		NF 360, Experimental Foods	3

	<i>Credits</i>
MFE 274, Consumer Attitudes and Demand	3
NF 390, Seminar in Food	1
Professional Electives. These may include limited electives listed under Pre-Professional, or additional Home Economics courses in other areas than Nutrition and Food	9
V. Electives	10

127. MAN AND NUTRITION.

Fundamentals of nutrition and its role in contemporary life. Development of man's food habits encompassing psychological, social, racial, economic and geographical factors. 3 class hours. *Credit, 3.*

130. MEAL MANAGEMENT.

Selecting foods, planning, preparing, and serving meals; emphasis on management of time, money, and energy. 2 class hours, 1 3-hour laboratory. *Credit, 3.*

141. FUNDAMENTALS OF NUTRITION.

The science of nutrition with emphasis on its importance in health professions. Open only to students of Nursing and allied professions. Prerequisite, Chemistry 112. 3 class hours. *Credit, 3.*

156. FOOD PREPARATION AND MEAL PLANNING.

Basic food principles, purchasing, preparation and meal planning. Open to men and women. 2 class hours, 1 3-hour laboratory. *Credit, 3.*

251. PRINCIPLES OF FOOD PREPARATION.

Chemical and physical properties of food related to preparation and preservation. Prerequisite, Chemistry 160. 2 class hours, 1 3-hour laboratory. *Credit, 3.*

350. QUANTITY FOOD MANAGEMENT.

Management of food production in institutions, quality control, recipe standardization, portion and cost control, menu planning and work simplification. Prerequisite, NF 130 or 156. 2 class hours, 1 4-hour laboratory. *Credit, 4.*

351. INSTITUTIONAL ADMINISTRATION.

Principles of organization, management, sanitation, food service planning and equipment selection. 3 field trips. Prerequisite, NF 130 or 156. 2 class hours, 1 4-hour laboratory. *Credit, 4.*

352. HUMAN NUTRITION.

Absorption, utilization and interrelationship of food nutrients. Factors and critique of methods for determining nutrient requirements. Prerequisites, Chemistry 220 and permission of instructor. 3 class hours. *Credit, 3.*

360. EXPERIMENTAL FOODS.

Fundamental principles of food quality evaluation; development of independent research program. Prerequisites NF 251, Chemistry 160 or permission of instructor. 1 class hour, 2 3-hour laboratories. *Credit, 3.*

372. QUANTITY FOOD PURCHASING.

Food distribution and merchandising processes as they influence the purchasing of food for food service. Prerequisites, Accounting 125, Economics 125. 3 class hours. *Credit, 3.*

373. NUTRITION DURING GROWTH AND DEVELOPMENT.

Nutrition as it affects physical growth and development. Criteria for evaluating nutritional status of children. Prerequisite, NF 127 or 352. 3 class hours. *Credit, 3.*

375. NUTRITION IN DISEASE.

Physiological basis for therapeutic diets in certain diseases. Current medical and nutrition literature used. Prerequisites, NF 130, 352, Chemistry 220, Zoology 135, or permission of instructor. 3 class hours. *Credit, 3.*

386. PROBLEMS IN NUTRITION AND FOOD.

Intensive study in some phase of Nutrition and Food. Prerequisite, permission of instructor. *Credit, 1-3.*

387. PROBLEMS IN FOOD.

Intensive study in some phase of Food. Prerequisite, permission of instructor. *Credit, 1-3.*

388. PROBLEMS IN NUTRITION.

Intensive study in some phase of Nutrition. Prerequisite, permission of instructor. *Credit, 1-3.*

389. PROBLEMS IN INSTITUTIONAL ADMINISTRATION.

Intensive study in some phase of Institutional Administration. Prerequisite, permission of instructor. *Credit, 1-3.*

390. SEMINAR IN FOOD.

Reports and discussion of current research studies in Food. Prerequisite, permission of instructor. 1-3 class hours. *Credit 1-3.*

391. SEMINAR IN NUTRITION.

Reports and discussion of current research studies in Nutrition. Prerequisite, permission of instructor. 1-3 class hours. *Credit, 1-3.*

392. SEMINAR IN INSTITUTIONAL ADMINISTRATION.

Reports and discussion of current research studies in Institutional Administration. Prerequisite, permission of instructor. 1-3 class hours. *Credit, 1-3.*

Home Economics Education

Head of Department: Associate Professor Helen R. Vaznaian. Assistant Professor Sullivan; Instructors Lauroesch, Stilphen.

MAJOR IN SECONDARY EDUCATION AND EXTENSION

General Education—Total

Specified 46

Electives 12

(3 credits must have Letter E)

Credits

58

	Credits		Credits
Home Economics Core	16	Education 285, Observation and Student Teaching	6
Pre-Professional	18	NF 373, Nutrition During Growth and Development	3
Professional	32	Education 277, Principles of School Guidance	3
Physical Education	2	MFE 274, Consumer Attitudes and Demand	3
	Credits 126	TCEA 265, Clothing Selection and Design	3
I. General Education		TCEA 279, Interior Design	3
English 111 and 112, Composition	4	V. Electives	
English 125–126, 151–152, or 153–154	6	Three credits must have Letter E—other than Physical Science	12
Speech 101, Oral Communication	2	Special Sequences, such as journalism or other areas may be taken based upon student's interests.	
Sociology 101, Introductory	3	A semester of study at Merrill-Palmer or the University of New Mexico may be arranged based upon academic achievement.	
Sociology 256, Race Relations	3		
Psychology 101, General	3	120. INTRODUCTION TO HOME ECONOMICS.	
Psychology 261, Child Psychology, or HD 270, Child Development	3	Development, scope and character of home economics as a general and professional field of study; breadth and depth or professional opportunities. 1 class hour.	Credit, 1.
Psychology 263, Adolescent	3	261. COMMUNICATION BY DEMONSTRATION METHODS.	
Psychology 301, Educational	3	Adaptation of the learning process to the demonstration method of communicating. Prerequisites, Speech 101, 6 credits in major area, or permission of instructor. 1 class hour, 2 2-hour laboratories.	Credit, 3.
History 150 or 151, American	3	381. ADULT EDUCATION IN HOME ECONOMICS.	
Economics 125, Elements of	3	Organization of material, selection, use and evaluation of teaching techniques suited to group work with adolescents and adults. Credit toward meeting state standards for teachers and A.D.A. requirement. Prerequisite, minimum 6 credits in major area. 2 class hours, 1 2-hour laboratory.	Credit, 3.
Chemistry 101 and 102, or 111 and 112, General	6	382. CURRICULUM AND METHODS IN HOME ECONOMICS.	
Chemistry 160, Organic	4	Organization, scope and sequence of learning experiences in home economics education. Philosophy and content of curriculum, development of resource units, and methods of teaching. Prerequisites, Psychology 301, 263, and Education 251. 4 class hours.	Credit, 4.
II. Home Economics Core		386 to 389. PROBLEMS IN HOME ECONOMICS EDUCATION.	
HEEd. 120, Introduction to Home Economics	1	Intensive study of some phase of Home Economics Education. Prerequisite, permission of instructor.	Credit, 1–3.
NF 127, Man and Nutrition	3	390 to 392. SEMINAR IN HOME ECONOMICS EDUCATION.	
TCEA 123, Art for Living	3	Reports and discussion of current research studies in Home Economics Education. Prerequisite, junior standing. 1–3 class hours.	Credit, 3.
MFE 250, Family Management and Decision Making	3		
TCEA 141, Man and Clothing	3		
HD 380, Human Development in the Family	3		
III. Pre-Professional			
NF 130, Meal Management	3		
NF 251, Principles of Food Preparation	3		
TCEA 124, Textiles I	3		
TCEA 128, Fundamentals of Clothing Construction or TCEA 253, Advanced Clothing Construction	3		
Education 251, History of	3		
MFE 377, Theory and Application of Management	3		
IV. Professional			
HEEd. 382, Curriculum & Methods in Home Economics Education	4		
HEEd. 387, Problems in Home Economics Education	2		
HEEd. 388, Problems in Home Economics Education	3		
HEEd. 390, 391, Seminar in Home Economics Education	2		

Human Development

Head of Department: Assistant Professor Ellis G. Olim.
Professor Burroughs; Assistant Professors Collard, Turner.

MAJOR IN CHILD DEVELOPMENT

	<i>Credits</i>
General Education	51
Home Economics Core	9-10
Pre-Professional	18
Professional	29-33
Electives	15
Physical Education	2
<i>Credits</i>	124-129

I. General Education	<i>Credits</i>
English 111 and 112, English Composition	4
English 125 and 126, Masterpieces of Western Literature*	6
Speech 101, 105, 107, or 150	2
Zoology 101, Introductory	3
Zoology 135, Introductory Physiology	3
Sociology 101, Introductory	3
Anthropology 104, Cultural Anthropology	3
Psychology 101, General	3
Mathematics 111, Introductory	3
Philosophy 105, 125, 110, 161, or 243	3
Limited Electives from the following areas:	
Foreign Languages, Zoology, Psychology, Speech, Sociology, Anthropology, Recreation and Physical Education, Education, and Public Health	18

II. Home Economics Core	
HEEd. 120, Introduction to Home Economics (Freshmen only)	1
NF 127, Man and Nutrition	3
HD 379, Human Development in the Family	3
MFE 250, Family Management and Decision Making, or TCEA 123, Art for Living	3
III. Pre-Professional	
Education 251, Foundations of Education	3
TCEA 263, Art for the Young Child	3
Psychology 265, Exceptional Child	3
Psychology 325, Abnormal	3
Psychology 270, Personality	3
Anthropology 366, Sociology 251, 256, 259, 272 or 292	3

*Or any alternative 2-course sequence as offered by the College of Arts and Sciences.

IV. Professional	<i>Credits</i>
NF 373, Nutrition During Growth and Development	3
HD 270, Child Development	3
HD 310, Language and Cognitive Development	3
HD 350, Observational Child Study	3
HD 360, Theories of Human Development	3
HD 381, 382, Laboratory School Management	6
HD 383, 384, Student Teaching in the Laboratory School	6
HD 390, 391, Seminar in Human Development	1-3
HD 387, 388, Problems in Human Development	1-3

V. Electives	15-21
A semester of study at Merrill-Palmer may be arranged based on academic achievement.	

MAJOR IN HUMAN DEVELOPMENT

General Education	51
Home Economics Core	9-10
Pre-Professional	24
Professional	24
Electives	12
Physical Education	2
<i>Credits</i>	121-123

I. General Education	<i>Credits</i>
English 111 and 112, English Composition	4
English 125 and 126, Masterpieces of Western Literature*	6
Speech 101, 105, 107, or 150	2
Zoology 101, Introductory	3
Zoology 135, Introductory Physiology	3
Sociology 101, Introductory	3
Anthropology 104, Cultural Anthropology	3
Psychology 101, General	3
Mathematics 111, Introductory	3
Philosophy 105, 125, 110, 161, or 243	3
Philosophy 230, Philosophy of Science	3
Limited electives are to be chosen from a selected list of courses from the following areas: Foreign Languages, Zoology, Psychology, Speech, Sociology, Anthropology, Recreation and Physical Education, Education, and Public Health	15

*Or any alternative 2-course sequence as offered by the College of Arts and Sciences.

II. Home Economics Core	<i>Credits</i>
HEEd. 120, Introduction to Home Economics (Freshmen only)	1
NF 127, Man and Nutrition	3
HD 379, Human Development in the Family	3
MFE 250, Family Management and Decision Making, or TCEA 123, Art for Living	3
III. Pre-Professional	
Zoology 145, Human Genetics	3
Psychology 241, Elementary Statistics	3
Psychology 275, Exceptional Child	3
Psychology 325, Abnormal	3
Psychology 321, Personality	3
Three courses selected from the following:	
Anthropology 366, Sociology 251, 256, 259, 272, & 292	9
IV. Professional	
NF 373, Nutrition During Growth and Development	3
HD 270, Child Development	3
HD 310, Language and Cognitive Development	3
HD 350, Observational Child Study	3
HD 360, Theories of Human Development	3
HD 390, 391, Seminar in Human Development	3
HD 387, 388, Problems in Human Development	6

- V. Electives 12
- A semester of study at Merrill-Palmer may be arranged based on academic achievement.

270. CHILD DEVELOPMENT.
The child from the development point of view. Emphasis on interaction of heredity and environment on development. Prerequisites, Sociology 101, Psychology 101, or permission of instructor. 3 class hours. *Credit, 3.*

310. LANGUAGE AND COGNITIVE DEVELOPMENT.
Language and cognition from the developmental point of view. Emphasis on the relationship between language and thought and changes in the relationship in the course of cognitive growth. Prerequisite, HD 270, or equivalent. 3 class hours. *Credit, 3.*

350. OBSERVATIONAL CHILD STUDY.
Introduction to the methods of studying children by observation. Prerequisite, HD 270 or equivalent; or may be taken concurrently with HD 270. 3 class hours. *Credit, 3.*

360. THEORIES OF HUMAN DEVELOPMENT.
The major theories that have been devised to explain human development. Emphasis on psychological theories and concepts. The relevance and relationship of biological, social and anthropological concepts also covered. Prerequisite, HD 270 or equivalent. 3 class hours. *Credit, 3.*

380. HUMAN DEVELOPMENT IN THE FAMILY.
The family as the dynamic setting for the development of the human being from conception to senescence; roles and relationships at the various developmental stages. Prerequisites, Psychology 101 and Sociology 101. 3 class hours. *Credit, 3.*

381. LABORATORY SCHOOL MANAGEMENT I.
Principles and methods of early childhood education. Includes teaching methods and curriculum planning for two- to five-year-old children. Prerequisite, HD 270 or equivalent. 3 class hours. *Credit, 3.*

382. LABORATORY SCHOOL MANAGEMENT II.
Includes history, philosophies, and theories of early childhood education. Field trips. Prerequisite, HD 381, or permission of instructor. 3 class hours. *Credit, 3.*

383. STUDENT TEACHING IN THE LABORATORY SCHOOL.
Students plan, direct, and teach curriculum in the laboratory school under staff supervision. Prerequisite, HD 270. *Credit, 3.*

384. STUDENT TEACHING.
Continuation of teaching experience. Prerequisite, HD 383. *Credit, 3.*

387 or 388. PROBLEMS IN HUMAN DEVELOPMENT.
Intensive study of some phase of Human Development. Prerequisite, permission of instructor. *Credit, 1-3.*

390 or 391. SEMINAR IN HUMAN DEVELOPMENT.
Reports and discussion of current research studies in Human Development. Prerequisite, permission of instructor. 1-3 class hours. *Credit, 1-3.*

Textiles, Clothing and Environmental Arts

Head of Department: Associate Professor Sarah L. Hawes.
Professor Niederpruem; *Associate Professors* V. Davis, Johnston; *Assistant Professors* Paston, Randall; *Instructor* Porter; *Lecturers* Coughlin, Rainsford.

MAJOR IN FASHION MERCHANDISING

	<i>Credits</i>
General Education	57
Home Economics Core	16
Pre-Professional	18
Professional	19
Electives	12-15
Physical Education	2
<i>Credits</i>	<i>124-127</i>

I. General Education	<i>Credits</i>	TCEA 276, History of Decorative Arts
English 111 and 112, Composition	4	TCEA 279 Interior Design
English 125–126, 151–152, 153–154,		TCEA 378, Advanced Interior Design
Comparative Literature 201–202, French		TCEA 277, History of Costume
161–162, German 277–278, Italian 161–162,		TCEA 278, Applied Design
Spanish 161–162	6	TCEA 370, Textiles II
Speech 101, Oral Communication	2	TCEA 386–389, Problems in Textiles,
Mathematics 111, Introductory	3	Clothing and Environmental Arts
Physical or Biological Science—		
3 Sciences or 2 Sciences and Math	9	123. ART OF LIVING.
Sociology 101, Introductory	3	Development of an understanding of the visual arts, particularly
Psychology 101, General	3	the relationship between art and life, through a study of the
Economics 125, Elements of	3	elements and principles of design in theoretical and applied
Electives from the Humanities and		form. Study tours. 1 class hour, 4 studio hours. <i>Credit, 3.</i>
Social Sciences	12	
Electives	12	124. TEXTILES I.
II. Home Economics Core		Introductory study of fibers, fabrics, finishes of textile products
HEEd. 120, Introduction to Home Economics	1	related to their care and performance. Study tours. 2 class hours,
TCEA 123, Art for Living	3	1 2-hour laboratory. <i>Credit, 3.</i>
TCEA 141, Man and Clothing	3	128. FUNDAMENTALS OF CLOTHING CONSTRUCTION.
NF 127, Man and Nutrition	3	Fundamental principles of clothing construction as a form of
MFE 250, Family Management and Decision		artistic expression. 1 class hour, 2 2-hour laboratories. <i>Credit, 3.</i>
Making		
HD 380, Human Development in the Family	3	141. MAN AND CLOTHING.
III. Pre-Professional		The impact of clothing and textiles on the individual and society;
TCEA 124, Textiles I	3	sociological, psychological and economic implications as seen
TCEA 128, Fundamentals of Clothing		in historical and contemporary perspective. Prerequisite, Socio-
Construction or TCEA 253, Advanced		logy 101 or Psychology 101. 3 class hours. <i>Credit, 3.</i>
Clothing Construction	3	142. FASHION MARKETING.
TCEA 265, Clothing Selection and Design	3	Analysis of socio-economic factors underlying distribution of
TCEA 266, Fashion Accessories	3	fashion-oriented commodities from producer to consumer.
TCEA 374, Fashion Industries*	3	Study tours. Prerequisite, Economics 125. 3 class hours.
MFE 274, Consumer Attitudes and Demand	3	<i>Credit, 3.</i>
IV. Professional		253. ADVANCED CLOTHING CONSTRUCTION.
TCEA 142, Fashion Marketing	3	Study of patterns and problems of fitting with opportunities for
TCEA 380, Retailing Field Experience*	6	students to create original designs. Prerequisite TCEA 128, or
TCEA 390, or 391, Seminar in Textiles,		permission of instructor. 1 class hour, 2 2-hour laboratories.
Clothing and Environmental Arts	1	<i>Credit, 3.</i>
TCEA 387, or 388, Problems in Textiles,		263. ART FOR THE YOUNG CHILD.
Clothing and Environmental Arts	3	The teaching of art in relation to growth and development of
Marketing 201, Fundamentals of Marketing	3	children; program planning, evaluation and art resources. 2 class
Marketing 222, Marketing Communications or		hours, 3 studio hours. <i>Credit, 3.</i>
Marketing 223, Marketing Network Analysis	3	265. CLOTHING SELECTION AND DESIGN.
V. Electives	12–15	Basic criteria for selection and design of clothing for men,
*Students interested in a more diversified de-		women and children. Prerequisites, TCEA 123 and 141, or per-
partmental program could substitute any of		mission of instructor. 3 class hours. <i>Credit, 3.</i>
the following courses for Fashion Merchan-		
dising courses:		266. FASHION ACCESSORIES.
Ag. Eng. 261, House Planning		Factors involved in production, distribution, selection and evalu-
		ation of accessories: leather goods and furs, jewelry, ceramics,
		glassware, silverware, plastics and furniture. Study tours. 2 class
		hours, 1 2-hour laboratory. <i>Credit, 3.</i>

276. HISTORY OF DECORATIVE ARTS.

Style periods in their historic contexts, with emphasis on developments in furniture and furnishings. Illustrated lectures. Study tours. Prerequisite, TCEA 123, or permission of instructor. 3 class hours. *Credit, 3.*

277. HISTORY OF COSTUME.

Western costume from ancient civilizations to the present; exploration of the relationship of clothing to the period. Study tours. 3 class hours. *Credit, 3.*

278. APPLIED DESIGN.

Original designing which emphasizes principles of organization. Application to heighten understanding in techniques and media. Prerequisite, TCEA 123, or Art 120, or permission of instructor. 1 class hour, 4 studio hours. *Credit, 3.*

279. INTERIOR DESIGN.

Principles and practices of interior design including coordination of furnishings, backgrounds, accessories, color and lighting. Scale drawings, renderings, presentations and cost analysis. Study tours. 1 class hour, 4 studio hours. *Credit, 3.*

370. TEXTILES II.

Analysis and evaluation of recent scientific and technical developments in fibers and finishes. Study tours. Prerequisite, TCEA 124. 3 class hours. *Credit, 3.*

374. FASHION INDUSTRIES.

Development of foreign and domestic fashion industries with special emphasis on primary and secondary markets; evaluation of their importance to the economy. Prerequisite, Marketing 222 or 223. 3 class hours. *Credit, 3.*

378. ADVANCED INTERIOR DESIGN.

Advanced color theory; scale drawing, perspective drawings and renderings; investigation of sources and resources for interior designers and work problems in domestic and commercial interiors. Study tour. Prerequisites, TCEA 123, 276, 279, Ag. Eng. 261 or equivalent and permission of instructor. 1 class hour, 4 studio hours. *Credit, 3.*

380. RETAILING FIELD EXPERIENCE.

Supervised work-study program including 7-8 weeks off-campus experience in cooperating stores; evaluation of student's training, experience and development. Prerequisites, Marketing 222 or 223, TCEA 124, 142, 266, 6-8 weeks prior selling experience and permission of the department. *Credit, 6.*

386-389. PROBLEMS IN TEXTILES, CLOTHING AND ENVIRONMENTAL ARTS.

Intensive study of some phase of Textiles, Clothing and Environmental Arts. Prerequisite, permission of instructor. *Credit, 1-3.*

390 or 391. SEMINAR IN TEXTILES, CLOTHING AND ENVIRONMENTAL ARTS.

Reports and discussion of current research studies. Prerequisite, permission of instructor. 1-3 class hours. *Credit, 1-3.*

Management and Family Economics

Head of Department: Professor Verda M. Dale. *Assistant Professor* Merchant.

There is no Major.

250. FAMILY MANAGEMENT AND DECISION MAKING.

The integrated nature of management in the family; concerns, values and goals as reflected in decision making about family resources. Prerequisites: Sociology 101 and Psychology 101, or permission of instructor. 3 class hours. *Credit, 3.*

260. HOUSEHOLD EQUIPMENT.

Physical principles, construction, materials, and economic considerations underlying selection, use and care of household equipment. 2 class hours, 1 2-hour laboratory period. *Credit, 3.*

274. CONSUMER ATTITUDES AND DEMAND.

The motives, attitudes, and expectations of consumer behavior as influencing variables operating within and on the market. Prerequisites, Economics 125, Psychology 101, Sociology 101, or permission of instructor. (Also listed as Marketing 278). 3 class hours. *Credit, 3.*

275. PERSONAL AND FAMILY ECONOMICS.

Analyzing financial problems and alternatives available to individuals and families under changing conditions. Exploring aspects of financial institutions affecting people in our economic society. Prerequisite, Economics 125, or permission of instructor. 3 class hours. *Credit, 3.*

377. THEORY AND APPLICATION OF MANAGEMENT.

Theory and application of principles of effective home management: problem-solving applied to theoretical and practical situations. Prerequisite, MFE 250. 2 class hours, 1 2-hour laboratory period. *Credit, 3.*

387 or 388. PROBLEMS IN MANAGEMENT AND FAMILY ECONOMICS.

An intensive study of some phase of management or family economics. Prerequisite, permission of instructor. *Credit, 1-3.*

390 or 391. SEMINAR IN MANAGEMENT AND FAMILY ECONOMICS.

Reports and discussion of current research studies in Management and Family Economics. Prerequisite, permission of instructor. 1-3 class hours. *Credit, 1-3.*

School of Nursing

MARY A. MAHER, Dean

Lillian R. Goodman, Associate Dean

Maternal and Child Nursing; Associate Professor Sharp; Assistant Professors Hines, Redding, Sheridan, Walker; Instructor Millett. *Medical-Surgical Nursing*: Professor Helming; Assistant Professors Norman, Sweeney; Instructors Auton, Entekin, Grancio, Moore; Clinical Instructor Lamont. *Fundamentals of Nursing*: Associate Professor Nicholson; Assistant Professors Condron, Johnson; Instructors Eiben, Murphy; Clinical Instructor Bjorklund. *Nursing in the Community*: Assistant Professors Friedman, Petrunenko, Smith; Instructor Manor. *Psychiatric-Mental Health Nursing*: Associate Professor Winder; Assistant Professors Hall, Hoglund, Simmons, Whitbeck. *Administration of Nursing Care*: Assistant Professor Carbonnel; Instructor LaMonica. *Graduate Program—Medical-Surgical Nursing*: Professor Earles; Assistant Professor Martocchio; *Psychiatric-Mental Health Nursing*: Associate Professor Salenius. *Research*: Lecturer Lee.

FRESHMAN YEAR

1st Semester	Credits
English 111, English Composition	2
Chemistry 111, General	3
Sociology 101, Introduction	3
Social Science	3
*Speech 101 (or 105, 107, 150)	2
*Nursing 100, Introduction	3
General Physical Education	1
2nd Semester	Credits
English 112, English Composition	2
Chemistry 112, General	3
Zoology 101, Introduction	3
Psychology 101, General	3
Social Science	3
*Speech 101 (or 105, 107, 150)	2
*Nursing 100, Introduction	3
General Physical Education	1

One course elected from: History, Government, or Economics each semester. Students wishing to elect a foreign language may do so providing the basic requirements of the six credits in Social Sciences as indicated above are fulfilled prior to graduation. If a language is elected, intermediate proficiency is required.

*May be taken either semester.

SOPHOMORE YEAR

1st Semester	Credits
Microbiology 140, Introductory	3
Microbiology 141, Laboratory	1
Zoology 137, Human Anatomy and Physiology	4
Nursing 110, Fundamentals of Nursing	4
One course selected from the following:	
English 125, Masterpieces of Western Literature	3
NF 141, Fundamentals of Nutrition	3
Special Problems 385	3
2nd Semester	Credits
Biochemistry 120, Introduction	4
Zoology 138, Human Anatomy and Physiology	4
Nursing 111, Fundamentals of Nursing	4
One course selected from the following:	
English 126, Masterpieces of Western Literature	3
Special Problems 385	3

JUNIOR YEAR

1st Semester	Credits
Nursing 200, Nursing of the Child and Adult	12
One course selected from the following:	
NF 141, Fundamentals of Nutrition	3
English 125 or 126, Masterpieces of Western Literature	3
Special Problems 386	3
*Elective	3
2nd Semester	Credits
Nursing 210, Nursing of the Child and Adult	12
One course selected from the following:	
English 125 or 126, Masterpieces of Western Literature	3
Special Problems 385	3
*Elective	3

*There is an upperdivision elective requirement of nine credits, of which a minimum of three credits shall be in the Behavioral Sciences and three credits in the Humanities. These are selected during the Junior and Senior Years.

SENIOR YEAR

1st Semester

	<i>Credits</i>
*Nursing 300, Maternal and Infant Nursing	6
*Nursing 301, Nursing in the Community	6
Nursing 390, Professional Foundations of Nursing	3
**Elective	3

2nd Semester

	<i>Credits</i>
*Nursing 302, Psychiatric-Mental Health Nursing	6
*Nursing 303, Administration of Nursing Care	6
**Elective	3

*Clinical nursing courses are taken either during the first or second semester, depending on the clinical rotation of the individual student.

**See electives under Junior Year.

100 (I), (II). INTRODUCTION TO NURSING.

Designed to assist the individual in personal and professional adjustment to nursing. Enrollment limited to students of nursing.

Credit, 3. Clinical Nursing Faculty.

110 (I). FUNDAMENTALS OF NURSING.

Aims at acquisition of beginning knowledge and skill considered basic to an effective nurse-patient relationship as well as technical skills. Selected experiences in the nursing care of the adult in a health agency. Prerequisite, Nursing 100.

Credit, 4. Fundamentals of Nursing Faculty.

111 (II). FUNDAMENTALS OF NURSING.

Continuation of Nursing 110. Prerequisite, Nursing 110.

Credit, 4. Fundamentals of Nursing Faculty.

200 (I), (II). NURSING OF THE CHILD AND ADULT.

Selected health problems of children and adults, and impact of acute illness and hospitalization on the individual and his family. Correlated clinical practicum in the care of selected hospitalized patients aims at the acquisition of competence and judgment in administering comprehensive nursing care. Prerequisite, Nursing 111.

Credit, 12.

Medical and Surgical and Pediatric nursing faculty and allied professional staffs of the Springfield Hospital Medical Center and other community health agencies.

210 (I), (II). NURSING OF THE CHILD AND ADULT.

Selected health problems of children and adults, and impact of long term illness and hospitalization on the individual and his family. Correlated clinical practicum in the care of selected hospitalized patients aims at the acquisition of competence and judgment in administering comprehensive nursing care.

Credit, 12.

Medical and Surgical and Pediatric nursing faculty and allied professional staffs of the Springfield Hospital Medical Center and other community health agencies.

300 (I), (II). MATERNAL AND INFANT NURSING.

Application of basic concepts and principles of nursing to care of mothers during maternity cycle and to newborn infants. Correlated practicum provides experience in care of selected mothers and infants in the hospital and home. Prerequisite, Nursing 200, 210.

Credit, 6.

Maternal and Child Nursing, Public Health Nursing and Mental Health Nursing faculties; allied professional staffs of the Wesson Maternity Hospital and other community health agencies.

301 (I), (II). NURSING IN THE COMMUNITY.

Application of basic concepts of public health and public health nursing to the care of individuals, families and community groups. Correlated practicum provides experience in the care of selected individuals, families and groups served by official and non-official public health nursing services. Prerequisites, Nursing 200, 210.

Credit, 6.

Public Health Nursing, Maternal and Child Nursing, and Mental Health Nursing faculties; professional staffs of the Visiting Nurse Association of Springfield, the Springfield Health Department and other community health agencies.

302 (I), (II). PSYCHIATRIC-MENTAL HEALTH NURSING.

Aims at acquisition of knowledge and skills needed to function with beginning proficiency as a professional nurse on psychiatric-mental health team. Correlated clinical practicum provides opportunity for establishing the basis for therapeutic communication with individual and groups of patients with psychiatric problems. Prerequisites, Nursing 200, 210.

Credit, 6.

Psychiatric-Mental Health Nursing faculty and professional staffs of the Northampton State Hospital and other community health agencies.

303 (I), (II). ADMINISTRATION OF NURSING CARE.

Focuses on professional's role in evaluating, planning and organizing nursing care relevant to specific conditions and responsive to changing demands. Includes patterns of organization in a variety of clinical settings, with opportunity to apply principles to the nursing team. Prerequisites, Nursing 200, 210.

Credit, 6.

Clinical Nursing faculty and professional staffs of the Wesson Memorial Hospital and other community health agencies.

385 (I), 386 (II). SPECIAL PROBLEMS.

Independent study of nursing problem. For qualified juniors.

Credit, 1-2. Staff.

387 (I), 388 (II). SPECIAL PROBLEMS.

Independent study of nursing problem. For qualified seniors.

Credit, 1-2. Staff.

390 (I). PROFESSIONAL FOUNDATIONS OF NURSING.

Exploration of professional responsibilities and relationships of the nursing practitioner. Enrollment limited to senior students of nursing. 3 class hours.

Credit, 3. Staff.

School of Physical Education

WARREN P. McGUIRK, *Dean*

David C. Bischoff, *Associate Dean*

PHYSICAL EDUCATION FOR MEN

Head of Department: Professor H. J. VanderZwaag, Professors Campney, Kroll, Ricci, Zunic; Associate Professors Garber, James, Lewis, Loy, Plagenhoef; Assistant Professors Barber, Cobb, Edington; Instructors Ariel, Beal, Brosky, Gundersheim, Kjeldsen.

JOINT DEPARTMENTAL COURSES

*PE 100. PHYSICAL EDUCATION. Skills courses in sport, dance, and other forms of physical activity available to all students in the University. 3 class hours. *Credit, 1*

*PE 101. PHYSICAL EDUCATION. Theoretical and/or skill instruction in sport, dance, and other forms of physical activity. 4 to 6 class hours or equivalent. *Credit, 1 or 2.*

PE 141. HUMAN ANATOMY. Gross structure and function of the body. 2 lecture hours, 1 2-hour laboratory period. *Credit, 3.*

PE 142. KINESIOLOGY. Anatomical application as a basis to a thorough understanding of mechanical problems in motor skills. Prerequisite, Physical Education 141. 2 lecture hours, 1 2-hour laboratory period. *Credit, 3.*

PE 200. SOCIOLOGY OF SPORT AND PHYSICAL ACTIVITY. Social action theory, group structure, social institutions, social processes, current cultural trends, and social problems in sport. Prerequisite, Sociology 101. 3 class hours. *Credit, 3.*

PE 201. PSYCHOLOGY OF SPORT AND PHYSICAL ACTIVITY. Variables of skilled performance; behavioral patterns and interactions in games, sports, and dance activities; evaluation of skilled performance. Prerequisite, Psychology 101. 3 class hours. *Credit, 3.*

PE 202. HISTORY OF SPORT AND PHYSICAL ACTIVITY. A survey of the history of sport, dance, and other forms of organized, physical activity throughout the Western world. Prerequisite, History 100 or 101. 3 class hours. *Credit, 3.*

PE 203. PHILOSOPHY OF SPORT AND PHYSICAL ACTIVITY. A philosophical analysis of sport and physical activity. Consideration of the nature and values of sport and its role as a meaningful activity. Prerequisite, Philosophy 105. 3 class hours. *Credit, 3.*

PE 206. PERCEPTUAL MOTOR DEVELOPMENT. Motor development in the child, particularly focusing on conditions affecting the learning of motor skills. *Credit, 3.*

* Each student in the University is required to complete 2 credits in physical education.

PHYSICAL EDUCATION FOR WOMEN

Head of Department: Professor Margaret A. Coffey; Professors Berlin; Associate Professors Hubbard, Ogilvie, Riggs, Vendien, Wallace; Assistant Professors Gerber, Patton, Reid, Rupp, Shute; Instructors Craft, Farr, Kjeldsen, Purnell, Reed.

PE 240. DANCE HISTORY. Dance history as a performing art in Western culture. 3 class hours. *Credit, 3.*

PE 243. DANCE PRODUCTION. Dance production relating to both the artistic and technical direction of the performing art. 2 class hours, 1 2-hour lab. *Credit, 3.*

PE 245. DANCE COMPOSITION. Choreography. 1 class hour, 1 2-hour lab. *Credit, 2.*

PE 253. PHYSICAL EDUCATION FOR ELEMENTARY SCHOOLS. Discussion of program content for elementary school physical education and presentation of methods used for teaching physical education activities at the elementary school level. 3 class hours. *Credit, 3.*

PE 259. KINESIOTHERAPY. Programs of developmental activities, suited to interests and capacities of students with disabilities who are restricted from participation in activities of the general physical education program. Prerequisite, PE 142. 3 class hours. *Credit, 3.*

PE 261. WORLD HISTORY OF SPORT. An examination of factors influencing the rise of sport and the role of sport in society. Prerequisite PE 202. 3 class hours. *Credit, 3.*

PE 263. ANALYSIS OF RHYTHM. Analysis of rhythmic structure of music and its application to motor activity. 2 class hours, 1 2-hour laboratory period. *Credit, 3.*

PE 264. PHILOSOPHY OF SPORT. A philosophical analysis of key concepts which influence the objectives and content of various programs in the broad realm of sport. Prerequisite, PE 203 or equivalent. 3 class hours. *Credit, 3.*

PE 265. SOCIOLOGY OF SPORT. Sport studied as a social institution, including both the structure and function of sport. Topics include theories explaining the role of sport in society; the incidence, form, and regulation of sport in society; physical activity in contemporary society; and the social psychology of sport, including personality, attitude, and motivation. Prerequisite, PE 200. 3 class hours. *Credit, 3.*

PE 274. THEORY OF MEASUREMENT AND EVALUATION.
Construction, interpretation, and evaluation of tests, including the theory of grading. 3 class hours. *Credit, 3.*

PE 275. PREVENTION AND CARE OF INJURY IN ACTIVITY.
Theory and techniques in preventing and treating all types of physical injuries including first aid treatment as well as therapeutic aids and clinical use of physiotherapy equipment. Prerequisite, PE 142. 2 class hours, 1 2-hour lab. *Credit, 3.*

PE 276. PRINCIPLES OF PHYSICAL EDUCATION.
Discussion of aims and objectives in physical education; also presentation and critical analysis of curricular, methodological, and adapted, principles as they apply to the teaching of physical education. 3 class hours. *Credit, 3.*

PE 277. PSYCHOLOGY OF COACHING.
Analysis of psychological content in athletics and coaching. Topics include personality and motivation, mental health aspects, competitive spirit, sportsmanship, and selected problems in coaching pertaining to psychological factors. Prerequisites, Psychology 101 and Psychology 263 or permission of instructor. 3 class hours. *Credit, 3.*

PE 278. PHYSIOLOGY OF EXERCISE.
Application of basic physiological concepts of the program of physical education, emphasizing physiological effects and adjustments accruing from participation in physical activity. Prerequisite, Zoology 135. 2 class hours, 1 2-hour laboratory period. *Credit, 3.*

PE 321. PHYSIOLOGICAL BASIS OF HUMAN PERFORMANCE.
Analysis and interpretation of cardiovascular-pulmonary adjustment, metabolic requirement, and heat regulation during exercise. Prerequisite, PE 278. 2 class hours, 1 2-hour lab. *Credit, 3.*

PE 331. MECHANICAL ANALYSIS OF HUMAN MOTION.
Application of the principles of mechanics to the analysis of human motion. Prerequisite, PE 142 or equivalent. 2 class hours, 1 2-hour lab. *Credit, 3.*

PE 341. MOTOR INTEGRATION.
Examination of the control of muscular activity by the nervous system. Topics include basic motor system reflexes, cross transfer, fatigue, kinesthetic sense, lateral dominance, and neuromuscular facilitation techniques. Prerequisites, PE 142 and PE 278. 3 class hours. *Credit, 3.*

PE 351. THEORY OF THERAPEUTIC EXERCISE.
The theory of therapeutic exercise for the mentally retarded, physically handicapped, and normal. Prerequisite, PE 259 or equivalent. 3 class hours. *Credit, 3.*

PE 354. PHYSICAL EDUCATION IN THE SCHOOL.
Discussion of content and presentation of methods which are designed to prepare the student for the educational internship in the schools. Focus is on the applicability of micro-teaching techniques to situations in teaching physical education activities. 3 class hours. *Credit, 3.*

PE 362. HISTORY OF SPORT IN THE UNITED STATES.
Sport in America from earliest times to the contemporary period. Emphasis will be placed on the social, political, and economic factors which affected the development of sport. Prerequisite, PE 261. 3 class hours. *Credit, 3.*

PE 363. COMPARATIVE SPORT.
A comparative analysis of sport and athletics in selected countries. Special emphasis will be given to historical, cultural, and social values affecting the status of sports and recreation, and current international cooperation. Prerequisite, PE 261. 3 class hours. *Credit, 3.*

PE 370. ORGANIZATION AND ADMINISTRATION.
Discussion of administrative theory and practice as they relate to the program of physical education in the schools. 3 class hours. *Credit, 3.*

PE 381. ADMINISTRATION OF INTRAMURAL PROGRAMS.
Objectives, tourney design, organization and administration of intramural programs. 2 class hours. *Credit, 1.*

PE 385-386. SPECIAL PROBLEMS.
Presentation and discussion of research in physical education, theory of sport, or exercise science. 3 class hours. *Credit, 3.*

PE 390. SEMINAR.
Analysis of studies and issues in physical education. 3 class hours. *Credit, 3.*

PHYSICAL EDUCATION FOR WOMEN

WPE 102 Skill courses designed primarily for women majors
WPE 104 in physical education. Instruction focuses both on
WPE 106 skill in the activity and learning to teach the skill.
WPE 108 Activities are offered in aquatics, gymnastics, and
WPE 110 sports. 6 class hours *Credit, 2.*
WPE 112
WPE 114
WPE 116
WPE 118
WPE 120

WPE 144. TECHNIQUES AND PRACTICE IN
OFFICIATING VARIOUS SPORTS.
2 class hours. *Credit, 2.*

PHYSICAL EDUCATION FOR MEN

MPE 103 Skill courses designed primarily for men majors in
MPE 105 physical education. Instruction focuses both on
MPE 107 skill in the activity and learning to teach the skill.
MPE 109 All majors must take basic skill courses in gymnastics,
MPE 111 track and field, and aquatics. Other courses
MPE 113 cover the wide spectrum of individual, dual, and
MPE 115 team sports in this culture. 6 class hours. *Credit, 2.*
MPE 117
MPE 119
MPE 121

MPE 143. OFFICIATING.

Techniques and practice in officiating various sports. 2 class hours. May be requested for a total of 4 credits. *Credit, 2.*

Recreation

Head of Department: Professor William E. Randall. *Assistant Professor:* Sherrow. *Instructor:* Willmann.

SOPHOMORE YEAR

1st Semester	Credits
English 125, Masterpieces of Western Literature	3
Math. or Nat. Science Elective	3
Arts & Sciences Elective*	3
Speech 201, Public Speaking	3
Recreation 101, Intro. to Rec.	3
PE 100	1
Recreation 003, Field Experience	0
(Military or Air Science 125)	1)
	16

2nd Semester

English 126, Masterpieces of Western Literature	3
Math. or Nat. Science Elective	3
Arts & Sciences Elective*	3
Psychology Elective	3
Recreation 111, Program Activities I	3
PE 100	1
Recreation 004, Field Experience	0
(Military or Air Science 126)	1)
	16

*Economics 125 and Government 100 recommended.

JUNIOR YEAR

1st Semester	Credits
Sociology Elective	3
Social Science Elective	3
Engl. 337, Adv. Expository Writing	3
Option Electives	6
	15

2nd Semester

Sociology Elective	3
Social Science Elective	3
Rec. 230, Group Leadership	3
Option Electives	6
	15

SENIOR YEAR

1st Semester	Credits
Accelerated Block Semester*	
Rec. 350, Rec. Management	4
Rec. 351, Outdoor Recreation	3
Rec. 352, Org. & Adm. of Rec.	3
Rec. 380, Internship	5
	15

2nd Semester

Recreation 390, Seminar	1
Option Electives	6
Electives	8

*Prerequisite: 2.0 Cumulative Quality Point Average and Senior Standing as a Major in Recreation.

003 (I), 004 (II). FIELD EXPERIENCE.

Supervised experience as a volunteer, in leadership or other appropriate roles, in approved settings, for not less than 20 hours per semester. Enrollment limited to recreation majors. *Credit, 0.*

101 (I), (II). INTRODUCTION TO RECREATION.

Fundamental concepts, current status, and established principles of recreation as a social force. Field trip costs approximately \$3.00. 3 class hours. *Credit, 3.*

111 (I), (II), 112 (I), (II). PROGRAM ACTIVITIES I AND II.

Analysis of participant and activity characteristics; essential facilities, equipment, and supplies; specialized leadership techniques and fundamental program skills. 2 class hours, 4 laboratory hours, including field trips, which cost approximately \$6.00. *Credit, 3.*

131 (II). ORGANIZED CAMPING.

Operating procedures of organized camps. Camper guidance, program skills, and practical leadership experience. Two-night camping trip, plus one-day trip. Cost of trips approximately \$15.00. 2 class hours, 1 2-hour laboratory period. *Credit, 3.*

230. (I), (II). GROUP LEADERSHIP.

Foundations and tools for leadership. Successful leadership techniques for large and small groups such as clubs and committees. Field trips. 2 class hours, 1 2-hour laboratory period. *Credit, 3.*

350 (I), (II). RECREATION MANAGEMENT.

Planning and development of comprehensive recreation programs and services, including facility operation and supervision of employed and volunteer personnel. Field trips cost approximately \$5.00. Open only to majors in the concentrated senior block. 4 class hours. *Credit, 4.*

351 (I), (II). INTRODUCTION TO OUTDOOR RECREATION.

Characteristics, principles and practices of outdoor recreation, including current developments; relationship to other uses of land and water resources. Field trips cost approximately \$50.00. Taught jointly by the Departments of Recreation, Landscape Architecture, and Forestry and Wildlife Management. 3 class hours. Open only to majors in the concentrated senior block. *Credit, 3.*

352 (I), (II). ORGANIZATION & ADMINISTRATION
OF RECREATION.

Functions and methods for supervisors and assistant superintendents of various types of park and recreation agencies. Field trip costs approximately \$5.00. 3 class hours. Open only to majors in the concentrated senior block. *Credit, 3.*

353 (II). ENVIRONMENTAL INTERPRETATION.

Principles and practices in interpretation for public appreciation of natural, archaeological and historical features in parks, museums and similar settings. Field trips cost approximately \$5.00. Prerequisites, 18 credits in one of the following areas: Anthropology, American History or the natural sciences; and permission of instructor. 2 class hours. 1 2-hour laboratory. *Credit, 3.*

361 (I). INTRODUCTION TO OUTDOOR RECREATION.

Same course content as 351, but for non-recreation block students. Field trip cost is approximately \$30.00. *Credit, 3.*

362 (I). ORGANIZATION & ADMINISTRATION
OF RECREATION.

Same course content as 352, but for non-recreation block students. Field trip cost is approximately \$5.00. *Credit, 3.*

380 (I), (II). INTERNSHIP.

Professional field experience with an approved cooperating recreation agency appropriate to the student's career choice. Open only to majors in the concentrated senior block. *Credit, 5.*

385 (I), 386 (II). SPECIAL PROBLEMS.

Individual intensive study of an aspect of recreation and presentation of results in written form. *Credit, 2-3.*

390 (I), (II). SEMINAR.

Critical consideration of basic philosophies and problems in recreation. Prerequisite, Recreation 101 or 351. 2 class hours. *Credit, 1.*

Department of Athletics

W. P. McGuirk, *Athletic Director*; R. W. O'Connell, *Assistant Athletic Director*; A. Barber, *Freshman Baseball Coach*; H. Barr, *Varsity Wrestling Coach*; R. Bergquist, *Varsity Baseball Coach*; R. Bresciani, *Assistant Director of Sports Information*; P. Broaca, *Varsity Soccer Coach and Assistant Basketball Coach*; M. Brosky, *Freshman Wrestling Coach*; J. Canniff, *Varsity Hockey Coach*; R. Cieplik, *Freshman Soccer Coach*; W. Fesperman, *Assistant Football Coach*; V. Fusia, *Head Football Coach*; R. Garber, *Varsity Lacrosse Coach*; P. Graham, *Assistant Director of Intramural Athletics*; R. Graham, *Assistant Football Coach*; J. Gundersheim, *Freshman Gymnastics Coach*; G. Karras, *Assistant Football Coach*; V. Keedy, *Supervising Physiotherapist*; D. Kelley, *Freshman Football Coach*; E. Kjeldsen, *Varsity Gymnastics Coach*; S. Kosakowski, *Varsity Tennis Coach and Director of Stockbridge Athletics*; J. Laughnane, *Athletic Trainer*; J. Leaman, *Varsity Basketball Coach*; W. Novak, *Staff Assistant*; K. O'Brien, *Varsity Track and Cross Country Coach*; R. Page, *Director of Sports Information*; M. Piepul, *Assistant Football Coach and Freshman Lacrosse Coach*; J. Rogers, *Varsity and Freshman Swimming Coach*; A. Rufe, *Financial Manager of Athletics*; T. Schmitt, *Director of Intramural Athletics*; G. Schwartz, *Assistant Track Coach*; W. Smith, *Athletic Trainer*; R. Wilson, *Assistant Basketball Coach*.

Department of Public Health

Head of Department: Professor William A. Darity, Professors Berger, Gage, Peterson; Assistant Professors Peters, Read, Thiebaut, Wisniewski; Instructors Crowley, Stryker, Reed; Lecturers Davis, Kinsella, Lezer, Pollock, Prescott, Sullivan.

A minimum of 32 major credits is required of all students for the Bachelor of Science degree. The Master of Science degree is also offered in the Department of Public Health. (See Graduate School Bulletin for programs and requirements.)

ENVIRONMENTAL HEALTH (Public Health Option I)

SOPHOMORE YEAR

1st Semester

	Credits
English 125	3
Physics 103	4
Chemistry 127	4
Zoology 283, Parasitology	4
General Physical Education	1

<i>2nd Semester</i>	<i>Credits</i>
English 126	3
Physics 104	4
Chemistry 160	4
English 331	2
Elective*	3
General Physical Education	1

JUNIOR YEAR

<i>1st Semester</i>	<i>Credits</i>
PH 361, Environmental Health I	3
PH 383, Introduction to Public Health Practice	4
Microbiology 250, General	4
Statistics 121	3
PH 379, Environmental Health Laboratory I	3

<i>2nd Semester</i>	
PH 362, Environmental Health II	3
PH 384, Organization and Administration of Public Health Programs	4
Microbiology 280, Pathogenic	4
PH 380, Environmental Health Laboratory II	3
PH 372, Epidemiological Methods	4
Electives	3

Summer: PH 382, Field Training 3–6 credits

SENIOR YEAR

<i>1st Semester</i>	<i>Credits</i>
PH 331, Introduction to Occupational Health	3
Sociology 286, Sociology of Medicine	3
Chemistry 220, Biochemistry	4
or	
PH 385, Problems	3
or	
PH 263, Industrial Hygiene	3
Electives*	3–6

<i>2nd Semester</i>	
Chemistry 244, Radiochemistry	3
PH 386, Problems	3
CE 271, Principles of Sanitary Engineering	3
PH 332, Introduction to Air Pollution	3
Elective	3

*Elective chosen from Social and Behavioral Sciences or Humanities.

COMMUNITY HEALTH AND HEALTH EDUCATION (Public Health Option II)

<i>SOPHOMORE YEAR</i>	<i>Credits</i>
<i>1st Semester</i>	
English 125	3
Zoology 137	4

*Electives to be chosen from Social and Behavioral Sciences or Humanities, Public Health 301 or C.E. 374.

JUNIOR YEAR

<i>1st Semester</i>	<i>Credits</i>
PH 383, Introduction of PH Practice	4
PH 301, Principles of Community Health Education	4
PH 361, Environmental Health	3
Statistics 121***	3
Sociology Elective	3

<i>2nd Semester</i>	
PH 384, Organization and Administration of PH Programs	4
PH 304, School Health	3
Education Elective	3
PH 372, Epidemiological Methods	4

SENIOR YEAR

<i>1st Semester</i>	<i>Credits</i>
PH 382, Field Training and Studies*	3–10
PH 385, PH Problems and/or	3
Electives**	3–7

<i>2nd Semester</i>	
PH 302, Community Development and Health Education	3
PH 386, PH Problems	3
3 Electives**	9

*Students with Departmental approval may take Physics 101 and Physics 102. However, they must take an additional public health course with a laboratory for example, PH379 or PH 380 or another course approved by the department.

**Elective chosen from Humanities, or Social Sciences

***Students who take Statistics 231 and 232 instead of Math 123 and 124 or Math 135 and 136 will not be required to take this course.

Note.

Recommended courses include: Sociology 261, Population; Government 220, Municipal Govern.; Government 100, American Govern.; Economics 125, Elementary Econ.; Management 201, Principles of Management; Management 231, Administrative Theory (201 required as a prerequisite); Government 272, Public Administration; Sociology 292, Introduction to Social Welfare; Education 366, Preparation and Use of Visual Aids.

123 (I), (II). DYNAMICS OF PERSONAL AND COMMUNITY HEALTH.

Development of understanding and attitudes relative to personal, family and community health needs. Attention given to mental and physical well being, drugs, sexuality, communicable and chronic diseases and health services. 3 class hours. *Credit, 3.*

263 (I). INSTITUTIONAL HYGIENE AND SANITATION.

Practices and principles of industrial processes involved in industrial health and quality control. 3 class hours. *Credit, 3.*

264 (II). MICROSCOPY OF WATER.

Microscopic forms of life exclusive of bacteria. Counting and control of plankton in potable waters, elements of limnology. Prerequisite, Microbiology 140. 2 class hours, 1 2-hour laboratory period. *Credit, 3.*

301 (I). PRINCIPLES OF COMMUNITY HEALTH EDUCATION.

Principles of health education. Exploration of methods and approaches to community health. Family, school, and community dimensions and potentials. Types and use of various methods leading to community action. Permission of instructor. 3 class hours, 1 2-hour laboratory period. *Credit, 4.*

302 (II). COMMUNITY DEVELOPMENT AND HEALTH EDUCATION.

Latest approaches in community development and community organization processes. Exploratory readings, leadership assignments; community studies with emphasis on coordinated community action. Permission of instructor. 3 class hours. *Credit, 3.*

304 (II). SCHOOL HEALTH.

The principal concepts, methods and dynamics of the organization of a school health program at the elementary and secondary level. Stress is placed on the planning and teaching of problem areas (i.e. sex education, mental health and drugs). Junior or senior standing or permission of instructor. *Credit, 3.*

305 (I). CURRENT ISSUES IN HEALTH EDUCATION.

Latest issues in the field of health presented and discussed. Emphasis on controversial issues such as sex, drugs, and suicide. 3 class hours. *Credit, 3.*

311 (II). HUMAN SEXUALITY AND SEX EDUCATION.

Promotes insight into human sexuality in relation to modern life. Emphasis on human sexuality as it may appear in the infant, the child, the adolescent, and the young married adult, as well as an examination and clarification of some of the crucial dynamics of the present. Prerequisites, junior or senior standing and permission of instructor. 3 class hours. *Credit, 3.*

331 (I). INTRODUCTION TO OCCUPATIONAL HEALTH.

The relation of the occupational environment to health, efficiency, and well-being of workers. Prerequisites, Mathematics 112, Chemistry 160, Zoology 135 or permission of instructor. 2 class hours. 1 3-hour laboratory period. *Credit, 3.*

332 (II). INTRODUCTION TO AIR POLLUTION.

The effects of polluted air on man and his environment. Nature and behavior of particulate and gaseous components of air; sources and control of pollutants; air quality standards. Prerequisites, Mathematics 112, Chemistry 160, Zoology 135 or permission of instructor. 2 class hours. 1 3-hour laboratory period. *Credit, 3.*

337 (II). INTRODUCTION TO RADIATION PROTECTION.

The effect and control of radiation in the mammalian system. Includes the following topics: sources of radiation; measurement of radiation; radiosensitivity; target theory; radiation chemistry of biological molecules; cellular effects on embryogenesis; occupational, medical and environmental radiation exposures; safety methods in the uses of radiation. Prerequisite, permission of instructor. *Credit, 3.*

361 (I), 362 (II). ENVIRONMENTAL HEALTH.

The application of scientific knowledge to the control of man's environment. Air, water, waste disposal, food, housing, vector control, accidents, heat, light, noise, and ionizing radiation. Prerequisites, Chemistry 127, Chemistry 160, Microbiology 250, Physics 104, or permission of instructor. 3 class hours. *Credit, 3.*

372 (II). EPIDEMIOLOGICAL METHODS.

Methods and problems in descriptive, analytic, and experimental epidemiology. Includes socio-economic and biological elements in communicable and chronic diseases, in accidents, and in health of human population. Prerequisites, Statistics 121 or equivalent, Microbiology 140 or permission of instructor. 2 class hours, 2 2-hour labs. *Credit, 4.*

374 (II). CLINICAL BACTERIOLOGY.

Procedures in clinical laboratory work. Prerequisites, Microbiology 310, Zoology 135 or 137, 138. 1 class hour, 2 2-hour laboratory periods. *Credit, 3.*

375 (I). PUBLIC HEALTH STATISTICS.

Principles of statistics applied to the evaluation of public health practices. Prerequisites, Statistics 121 and a course in calculus, or permission of the instructor. 3 class hours and 1 2-hour laboratory period. *Credit, 3.*

378 (I), (II). EPIDEMIOLOGY OF COMMUNICABLE DISEASES.

Principles of spread of infections, supported through study of communicable diseases, grouped according to their mode of transmission. Permission of instructor. 3 class hours. *Credit, 3.*

379 (I). BASIC PUBLIC HEALTH LABORATORY.

Standard methods used in present applied bacteriology; soils, dairy products, water and shellfish and air analysis. Prerequisite, Microbiology 140 or 250, or permission of instructor. 2 class hours, 2 2-hour laboratory periods. *Credit, 3.*

380 (II). ADVANCED PUBLIC HEALTH LABORATORY.

Public health laboratory procedures; field collection of samples, stream pollution studies, food poisoning and infection, standard methods of food analysis. Prerequisite, Environmental Health Laboratory 379 or permission of instructor. 1 4-hour laboratory and 1 2-hour laboratory periods. *Credit, 3.*

382 (I), (II). (Summer). SUPERVISED FIELD TRAINING.
A field training program with an official health agency, approved by the Department. This must be under faculty supervision.
Credit, 3-10.

383 (I). INTRODUCTION TO PUBLIC HEALTH PRACTICE.
The philosophy, nature, and scope of modern public health practice. Prerequisites, Sociology 101 and Zoology 101 or permission of instructor. 3 class hours. 1 2-hour laboratory period.
Credit, 4.

384 (II). ORGANIZATION AND ADMINISTRATION OF PUBLIC HEALTH PROGRAMS.
The organization of public health programs and the requisite functional administrative structure. Includes planning and evaluation procedures. Prerequisite, permission of instructor. 3 class hours, 1 2-hour laboratory period.
Credit, 4.

385 (I), 386 (II). PROBLEMS.
Qualified seniors who have obtained permission from the department may arrange for independent work on special problems.
Credit, 3

390 (I), (II). SEMINAR. *Credits, 1-3.*

MEDICAL TECHNOLOGY

There are presently two courses of study which a medical technology major may option in pursuit of a Bachelor of Science degree. Option I is open only to students who have received grades of "C" or better in all their science and mathematics courses and who have spent a minimum of two years in residence at the University of Massachusetts. Transfer students must, therefore, elect Option II

OPTION I. This curriculum will consist of a three-year academic program followed by a twelve-month internship in an approved school of medical technology. After successful completion of the twelve-month internship and after satisfying the requirements of the department, a student will receive a Bachelor of Science degree. A total of 130 credits is necessary for graduation with this option.

SOPHOMORE YEAR

<i>1st Semester</i>	<i>Credits</i>
English 125	3
Chem. 261, 263 (Organic)	4
Elective (Humanities or Social Science)*	3
Zoo. 137 (Anatomy & Physiol.)	4
General Physical Education	1
Physics 101 or 103**	3-4

<i>2nd Semester</i>	<i>Credits</i>
English 126	3
Chem. 262, 264 (Organic)	4
Elective (Humanities or Social Science)*	3
Zoo. 138 (Anatomy & Physiol.)	4
General Physical Education	1
Physics 102 or 104**	3-4

JUNIOR YEAR

<i>1st Semester</i>	
Chem. 220 (Elem. Biochem.)	4
Micro. 250 (General)	4
Elective*	3
Elective†	3
<i>2nd Semester</i>	
Chem. 127 (Analytical)	4
Elective*	3
Micro. 280	4
Zoo. 223 (Histology)	3
Elective†	3
Zoo. 283 (Gen. Parasitology)	4
Public Health Elective	3
Stat. 121 (Elementary)	3
Vet. Sci. 370 (Gen. Vet. Path.)	3

*Minimum of 9 credits in social science and minimum of 3 credits in humanities.

**Physics 103 & 104 are recommended for future graduate study.

†Suggested electives in the sciences.

SENIOR YEAR

<i>1st Semester</i>	<i>Credits</i>
Micro. 310	4
Electives†	4
<i>2nd Semester</i>	<i>Credits</i>
Micro. 340 or Micro. 320	4
Electives†	4
†Suggested Science electives:	
Chem. 129 (Qual.)	3
Chem. 244 (Radiochem.)	3
Zoology 283	4
Public Health Elective	3
Statistics 121	3
Vet. Sci. 370	3

SENIOR YEAR

During the fourth year, students will serve a twelve-month internship in a hospital laboratory approved by the American Society of Clinical Pathologists and one with which the University of Massachusetts has reciprocal affiliation. If placement opportunities are limited, preference will be given to those students with superior over-all records. The student must complete all of the requirements established by the American Society of Clinical Pathologists to qualify for Registry of Medical Technology. The student who begins hospital internship for credit toward a degree must complete the full year of hospital training in order to be granted any credit. The course of training must be consistent at all times with the curriculum formulated by the Board of Schools of Medical Technology as approved by the American Society of Clinical Pathologists, the College of American Pathologists, the American Society of Medical Technologists, and the Council on Medical Education and Hospitals of the American Medical Association.

The curriculum offered by the hospital staff of the approved, affiliated hospital shall have the following schedule:

Course No.	Description	Lecture		
		Weeks	Hours	Credits
MT 301	Clinical Bacteriology	12	24	10
MT 302	Clinical Biochemistry	12	24	10
MT 303	Urinalysis	4	8	3
MT 304	Hematology	10	20	10
MT 305	Blood Bank and Serology	8	16	4
MT 306	Histology	4	8	3
		50	100	40

The hospital internship consists of 50 weeks at 40 hours per week. An accumulation of 2,000 hours will be realized. Two weeks of the 52 weeks are allowed for vacation or sick leave.

Total credits Senior Year Internship—40.

OPTION II. This is a four-year academic program leading to a Bachelor of Science degree. Following graduation the student will be assisted in arranging for a twelve-month internship in an approved hospital laboratory school. The student must complete all of the requirements established by the American Society of Clinical Pathologists to qualify for the Registry of Medical Technology. A total of 120 academic credits is necessary for graduation with this option.

Students electing Option II should follow the Option I program for the Freshman, Sophomore and Junior years.

101 (II). **INTRODUCTION TO MEDICAL TECHNOLOGY.**
Discussions, demonstrations, field trips, visiting lecturers and selected readings. *Credit, 1.*

270. PRINCIPLES OF CLINICAL METHODS AND INSTRUMENTATION II.

Use and principles of operation of instruments and auxiliary equipment commonly found in the hospital clinical laboratory. Prerequisite: Chemistry 127 or concurrently. Lecture: 2 hours. Laboratory: 2 3-hour sessions per week. *Credit, 4.*

301. CLINICAL MICROBIOLOGY.*

Lectures and supervised training in the areas of bacteriology, parasitology, virology and mycology, emphasizing methods for isolating and identifying specific disease-causing organisms. *Credit, 10.*

302. CLINICAL BIOCHEMISTRY.*

Lectures and supervised training in the analytical methods useful in the diagnosis of diseased states characterized by various abnormalities in the body chemistry. Emphasis on method development, quality control, and clinical interpretation. *Credit, 10.*

303. URINALYSIS.*

Lectures and supervised training in the chemical and microscopic methods used in the diagnosis of renal disease and other metabolic disorders. *Credit, 3.*

304. CLINICAL HEMATOLOGY.*

Lectures and supervised training in the principles of normal and abnormal blood cell production and the methods used in the diagnosis of specific blood diseases. *Credit, 10.*

305. IMMUNOHEMATOLOGY.*

Lectures and supervised training in the principles of blood banking and serology, emphasizing the genetic and immunologic qualities of the blood itself, the blood group systems, compatibility testing, and antibody detection. *Credit, 4.*

306. CLINICAL HISTOLOGY.*

Lectures and supervised training in the preparation of human tissues and organs for gross and microscopic examination as practiced in the hospital histopathology laboratory. *Credit, 3.*

390. MEDICAL TECHNOLOGY SEMINAR.

Credit, 1.

*Course given in affiliated hospital schools of Medical Technology during the year of clinical internship.

Division of Military and Air Science

MILITARY SCIENCE

SOPHOMORE YEAR

1st Semester

MS 125

Military History of the U.S.
Fundamentals of Leadership

Credits
1

2nd Semester

MS 376

Army Administration
Military Law
Obligations and Responsibilities of an Officer
Military Logistics
Internal Defense/Development

Credits
2

2nd Semester

MS 126

Fundamentals of Land Navigation
Introduction to Tactical Concepts
Fundamentals of Leadership

1

1st Semester

MS 377

Army Flight Instruction Program

3

1st Semester

MS 385

Special Problems

1 or 2

JUNIOR YEAR*

1st Semester

MS 251

Principles of Leadership
Military Teaching Techniques

2

2nd Semester

MS 386

Special Problems

1 or 2

2nd Semester

MS 252

Principles of Offensive and Defensive Combat
Counterinsurgency Operations and Concepts
Communications and Control Measures

2

Head of Department: Professor (Colonel, USA) George I. Connolly, Jr. Assistant Professors (Major) Rebello, (Captain) Kleb, (Captain) Emington.

SUMMER SESSION (6 WEEKS)

A period of training which permits the practical application of the academic subjects presented at the University. Included also are subjects which it is not practical to teach on campus. Cadets from the University complete this training at Indiantown Gap Military Reservation, Annville, Pennsylvania.

111 (I). U.S. DEFENSE ESTABLISHMENT I.

Introduction to national defense, organization and officer procurement; research and development of military weapons, and introduction to Branches of the Army and their mission, fundamentals of leadership. 2 class hours, 1 laboratory period.

Credit, 1.

112 (II). U.S. DEFENSE ESTABLISHMENT II.

Evolution of U.S. military policy and the part the Army plays in support of national policies; continuation of the fundamentals of leadership. 2 class hours, 1 laboratory period.

Credit, 1.

SENIOR YEAR*

1st Semester

MS 375

World Change and Military Implications
The Military Team

2

125 (I). BASIC MILITARY SCIENCE I.

American military history from the Revolutionary War to the Vietnamese conflict, with emphasis on the principles of war, Civil War lessons in mobility, and the effect of guerrilla tactics on present day warfare; leadership fundamentals. Prerequisites, Military Science 111 and 112, or equivalent credit as arranged by this department. 3 class hours, 1 laboratory period.

Credit, 1.

126 (II). BASIC MILITARY SCIENCE II.

Introduction to principles and fundamentals of contemporary military tactics, military land navigation and application of aerial photography. Principles applied in a series of practical exercises and classroom discussions; continuation of leadership fundamentals. Prerequisite, MS 125. 3 class hours, 1 laboratory period.

Credit, 1.

*Two academic subjects, selected from the following areas, must be completed by each student, one in his junior and one in his senior year.

- a. Effective Communication
- b. Science

- c. General Psychology
- d. Government

251 (I). LEADERSHIP AND MANAGEMENT I.

Techniques of military instruction and application of these techniques in classroom discussions and demonstrations; principles of military leadership and their application in the weekly laboratory period. Prerequisite, MS 126 or equivalent credit for previous military service or training. 3 class hours, 1 laboratory period.

Credit, 2.

252 (II). FUNDAMENTALS AND DYNAMICS OF MILITARY TEAM I.

Principles of offensive and defensive combat, applied to units of the infantry division brigade in map exercises; a portion of this period is devoted to military communications and control measures; current techniques and concepts of counterinsurgency operations; applied to situation type problems. Prerequisite, MS 251. 3 class hours, 1 laboratory period.

Credit, 2.

375 (I). FUNDAMENTALS AND DYNAMICS OF MILITARY TEAM II.

Command and staff; a continuation of Military Tactics including means of formulating a decision for an operation, introduction to the intelligence cycle, and organization for combat of the ROAD division and combined arms team. Examination of world change and military implications in view of U.S. national power and policies. Prerequisite, MS 252. 3 class hours, 1 laboratory period.

Credit, 2.

376 (II). LEADERSHIP AND MANAGEMENT II.

Fundamentals of military law, their application by the commander and their importance to the individual soldier; a survey of Army administrative procedures. Introduction to troop movements, supply and maintenance procedures. A brief introduction to Internal Defense Development, Civic Action and Service Orientation. Prerequisite, MS 375. 3 class hours, 1 laboratory period.

Credit, 2.

377 (I). ARMY FLIGHT TRAINING.

Aeronautics offered to eligible senior-year Army ROTC students who elect to serve as pilots in the U.S. Army. Students receive 35 hours of classroom instruction in meteorology, navigation, and Federal Aviation Regulations and 36½ hours of flight instruction under supervision of the Federal Aviation Agency. Upon completion of this course and passing FAA written examination cadets receive a private pilot's license. Enrollment by arrangement with the Professor of Military Science. 2 class hours, 2 laboratory periods.

Credit, 3.

385 (I), 386 (II). SPECIAL PROBLEMS.

Problems for qualified advanced ROTC students. Independent work on special problems or pertinent intensive studies. Enrollment by arrangement with the Professor of Military Science. Total credit may not exceed 2.

Credit, 1 or 2.

AIR SCIENCE

SOPHOMORE YEAR

1st Semester

Air Science 121,
Defense Policies and the Military

Credits

1

122—DIVISION OF MILITARY AND AIR SCIENCE

2nd Semester

Air Science 122,
Defense Organization

Credits

1

JUNIOR YEAR

1st Semester

Air Science 231,
Growth and Development of
Aerospace Power 1

3

2nd Semester

Air Science 232,
Growth and Development of
Aerospace Power II
Air Science 233,
Flight Instruction Program—Classroom

3

2

SENIOR YEAR

1st Semester

Air Science 341,
The Professional Officer I
Air Science 343,
Flight Instruction Program—Flight Phase

3

1

2nd Semester

Air Science 342,
The Professional Officer II
Air Science 343,
Flight Instruction Program—Flight Phase

3

1

Head of Department: Professor (Colonel) Friedman. Assistant Professors (Major) Hayes, (Captain) Duto, (Captain) Robinson.

111. THE U.S. AIR FORCE.

Introductory examination of the mission, organizational structure, and concepts of the U.S. Air Force. U.S. strategic offensive and defensive forces, nuclear weapons, and civil defense. 1 class hour, 1 hour of corps training.

Credit, 1.

112. U.S. MILITARY FORCES.

Aerospace defense, missile defense, U.S. general purpose forces, and Air Force support forces. The mission, resources, and operation of tactical air forces in limited war. Review of Army, Navy, and Marine general purpose forces and their concepts and organization. 1 class hour, 1 hour of corps training.

Credit, 1.

121. DEFENSE POLICIES AND THE MILITARY.

Defense policies, theories of general war, the nature of limited war, the defense policies and strategies of the Soviet Union and Red China, and the role of alliances in U.S. defense policies. 1 class hour, 1 hour of corps training.

Credit, 1.

122. DEFENSE ORGANIZATION.

The organization and function of the U.S. Department of Defense, the role of the military in the United States, and the elements and process of defense decision making. 1 class hour, 1 hour of corps training. *Credit, 1.*

231. GROWTH AND DEVELOPMENT OF AEROSPACE POWER I.

The development of aerospace power into a prime national security element, the development of doctrinal thought that concerns aerospace forces, and the role of technology in this growth and development. Presented in a general historical development from the beginnings of manned flight to the present. 3 class hours, 1 hour of corps training. *Credit, 3.*

232. GROWTH AND DEVELOPMENT OF AEROSPACE POWER II.

Future aeronautical equipment, astronautics, and space operations; future manned aircraft, space vehicles and systems; problems in space exploration, and future space programs. 3 class hours, 1 hour of corps training. *Credit, 3.*

233. FLIGHT INSTRUCTION PROGRAM—
CLASSROOM PHASE.

Aeronautics offered those students eligible for and electing to serve as pilots in the United States Air Force. 2 class hours. Permission of Department required. *Credit, 2.*

341. THE PROFESSIONAL OFFICER I.

Examines the professional concept of military duty, the framework of military law and the factors related to effective leadership. 3 class hours, 1 hour of corps training. *Credit, 3.*

342. THE PROFESSIONAL OFFICER II.

Military management concerned primarily with management functions and the role of command and staff in problem solving, advising, and decision making. 3 class hours, 1 hour of corps training. *Credit, 3.*

343. FLIGHT INSTRUCTION PROGRAM—FLIGHT PHASE.

Aeronautics course offered those students eligible for and electing to serve as pilots in the United States Air Force. This course provides a total of 36½ hours of flight instruction. Prerequisite, Air Science 233. By arrangement. *Credit, 1.*

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Index

Academic Calendar	3	Course Loads	10
Academic Regulations	5	Courses, Five-College	12
Accounting	79	Courses, Pass-Fail	6
Administrative Officers	124	Courses, Repeated	7
Advanced Placement	11	Cranberry Station	156
Aero-space Engineering	98	Credits, Accumulated	8
Agriculture, College of	13	For Study Abroad	12
Agricultural and Food Economics ..	13	Cumulative Average	7
Agricultural Engineering	14		
Air Science	122	Danish	44
Animal Sciences	22	Dutch	44
Anthropology	24		
Art	26	Economics	35
Arts and Sciences, College of	23	Education	86
Asian Studies	28	Electrical Engineering	94
Astronomy	62	Emeriti	128
Athletics	116	Engineering, School of	89
Attendance	5	English	37
Auditing	12	Enrollment	10
Average, Cumulative	6	Entomology	15
Average, Quality Point	8	Environmental Design	20
Average, Semester Grade Point	7	Environmental Sciences	16
		Examinations, Final	8
Biochemistry	29	Examinations, Credit by Special	12
Botany	30		
Board of Trustees	4	Faculty	135
Business Administration	79	Failures	6
		Finance	81
Calendar	3	Fisheries Biology	18
Chemical Engineering	89	Food Economics	13
Chemistry	32	Food Science and Technology	16
Civil Engineering	91	Forestry and Wildlife Management ..	16
Classics	65	Five-College Astronomy	62
Classification of Students	11	Five-College Courses	12
Comparative Literature	34	Freiburg Program	12
Computer Science	78	French	66
Conduct	5		
Core Curriculum Requirements	8	General Business and Finance	80
Course Changes	10	Geography	42
Course Directory	13	Geology	41

Germanic Languages and Literatures .	43	Portuguese .	68
Government .	44	Pre-Dental Curriculum .	23
Grading System .	5	Pre-Medical Curriculum .	23
Graduation Requirements .	8	Pre-Veterinary Curriculum .	23
Greek .	66	Probation, Scholastic .	7
		Psychology .	62
History .	47	Public Health .	116
Home Economics, School of .	103		
Home Economics Education .	105	Quality Points .	6
Honors .	9		
Honors Program .	50	Readmission .	8
Hotel and Restaurant Administration	19	Recreation .	115
Human Development .	107	Registration .	10
		Regulations, Academic .	5
Industrial Engineering .	97	Reports, Grade .	5, 9
Italian .	68	Requirements, Core Curriculum .	8
		Requirements, Dining .	9
Journalistic Studies .	51	Requirements, Graduation .	8
		Requirements, Residence .	9
Landscape Architecture .	20	Romance Languages .	65
Latin .	65	Russian .	70
Latin American Studies .	50		
Linguistics .	52	Scholastic Probation .	7
		Scholastic Termination .	7
Major, Change of .	11	Scholastic Warning .	6
Management .	83	Slavic Languages and Literatures .	70
Management and Family Economics .	110	Soil Sciences .	21
Marketing .	85	Sociology .	71
Mathematics .	52	Spanish .	68
Mechanical Engineering .	98	Speech .	72
Medical Technology .	119	Statistics .	55
Microbiology .	55	Study Abroad .	12
Military Science .	121	Swedish .	44
Music .	56		
		Termination, Scholastic .	7
Nursing .	111	Textiles, Clothing and	
Nutrition and Food .	103	Environmental Arts .	108
		Theatre .	74
Overseas Study .		Transcripts .	9
		Trustees .	4
Park Administration .	20		
Part-Time Students .	11	Veterinary and Animal Sciences .	22
Pass-Fail Courses .	6		
Payments Due .	10	Waltham Field Station .	156
Philosophy .	59	Warning, Scholastic .	7
Physical Education .	113	Wildlife Biology .	18
Physics .	60	Withdrawals .	11
Planning .	20	Wood Technology .	17
Plant and Soil Sciences .	21		
Plant Pathology .	21	Zoology .	75
Polish .	71		

UNIVERSITY OF MASSACHUSETTS



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Admissions Office
Whitmore Administration Building
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It is the policy of the University of Massachusetts that any and all acceptance of students for admission be without regard to race, color, or national origin.

1970-1971 Catalog

University of Massachusetts at Boston



CHANCELLOR FRANCIS L. BRODERICK

Contents

CORRESPONDENCE	4
ACADEMIC CALENDAR	5
FOREWORD	7
GENERAL INFORMATION	9
COURSES AND MAJOR REQUIREMENTS	31
HUMANITIES	31
Art	31
Classics	34
English	36
French	42
German	45
Italian	47
Music	49
Philosophy	50
Russian	51
Spanish	52
Theatre Arts	54
Divisional Courses	55
MATHEMATICS	57
NATURAL SCIENCES	60
Biology	60
Chemistry	61
Physics	63
Pre-medical	66
SOCIAL SCIENCES	66
Economics	66
History	68
Politics	72
Psychology	74
Sociology-Anthropology	76
Divisional Courses	78
AFRO-AMERICAN STUDIES	78
TEACHER CERTIFICATION PROGRAM	79
FACULTY OF RESIDENT INSTRUCTION	82
TRUSTEES OF THE UNIVERSITY	91
OFFICERS OF ADMINISTRATION	92
LOCATION OF DEPARTMENTS AT THE UNIVERSITY	95
INDEX	96

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Academic Calendar

University of Massachusetts, Boston 1970-71

FALL TERM

September	9-11	Wed-Fri	Registration and Orientation
September	14	Monday	Classes begin
October	12	Monday	Holiday
November	10	Tuesday	Wednesday schedule
November	11	Wednesday	Holiday
November	25	Wednesday	Vacation begins after last class
November	30	Monday	Classes resume
December	18	Friday	Vacation begins after last class
January	4	Monday	Reading period begins after last class
January	11	Monday	Final examinations begin
January	19	Tuesday	End of final examinations

SPRING TERM

January	27-29	Wed-Fri.	Registration
February	1	Monday	Classes begin
February	22	Monday	Holiday
April	16	Friday	Vacation begins after last class
April	26	Monday	Classes resume
May	12	Wednesday	Reading period begins after last class
May	19	Wednesday	Final examinations begin
June	4	Friday	Commencement



Foreword

The University of Massachusetts at Boston is a new urban state university founded to help provide educational opportunities and services needed by the citizens of Greater Boston at low cost. Now five years old, it graduated its first class in June, 1969. In 1970-71, 4,000 students are enrolled.

Thus far, the University has centered its efforts on an undergraduate curriculum in the liberal arts and sciences, seeking quality in this traditional area before moving into other fields. It gathers a community together on a generous student-faculty ratio (15-1) and then seeks to perform the perennial tasks of Western universities: to preserve and transmit what is known, to inquire into what is unknown, to train a new generation for its own inquiries into the known and the unknown.

In seeking to graduate liberally educated men and women, the University encourages its students to seek mastery over language (their own and one or more foreign languages) and to gain insight into the culture that these languages express; to probe the value of formal thought; to learn more about animate and inanimate nature; to become more aware of the methods and results of disciplines that investigate man, his institutions, his culture, and his physical world; to test man's aspirations against his experience as understood by the various disciplines.

As the University grows, it will go beyond its undergraduate curriculum in the liberal arts. It now has a Teacher Certification Program that meets the state standards. This fall, for the first time, it offers a new concentration in Afro-American Studies. Other programs will follow as our resources and the needs of the people we serve permit and demand.

The University, which as a commuting school has no residences, is located in the center of Boston, next to the Statler Hilton in Park Square, two blocks away from the Arlington Station of the MBTA, a block away from two bus terminals and two blocks from the Back Bay railroad station. The main building at 100 Arlington Street is supplemented by seven other buildings in the neighborhood of Park Square.

The University at Boston is part of the state-wide university system which includes the university campus at Amherst and the Medical School in Worcester.



General Information

Major Degree Programs Available:

HUMANITIES

Art	French	Philosophy
Classics	German	Russian
English	Italian	Spanish
	Music	

MATHEMATICS

Mathematics

NATURAL SCIENCES

Biology	Chemistry	Physics
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SOCIAL SCIENCES

Economics	Politics	Psychology
History		Sociology-Anthropology

Preparations are also available at the Boston campus in Afro-American Studies, Theatre Arts, Pre-Law, Pre-Medical, Pre-Dental, and Pre-Veterinary programs, as well as in Teacher Certification for the elementary and secondary schools.

Library

The University Library book collection contains approximately 100,000 volumes. Over 2,000 domestic and foreign journals are received currently in the periodical room. The Main Library, housed in the former First Corps Cadet Armory, is a spacious building which provides room for housing books, seating students and conducting library operations. In addition, a new science library, containing the collections in Biology, Chemistry, Mathematics and Physics, is located in the University's main building.

The library is easily accessible from all of the University buildings and forms a natural nucleus in its present site. In the main reading room and the periodical room, individual carrels provide seating for 350 students. The library's resources support the teaching programs of the University on every level.

Language Laboratories

The language laboratories of the University at Boston have the most modern electronic equipment available. With 71 student positions in three different laboratories, students have the opportunity of extended contact with the foreign

language being studied. The tapes used in laboratory sessions are closely correlated with classroom studies, and the recordings made by students during laboratory sessions can be played on standard recorders at home for advanced, individual study in such fields as drama, literature and music.

Educational programs are broadcast by closed circuit over 20 audio and two television channels. Two of the laboratories are used for basic language study and the third for individual study.

Students enrolled in courses which use the facilities of the language laboratories are required to pay a laboratory fee, and are issued a recording tape and a catalog for their own use during the year.

Admission

APPLICATIONS.

Applications for admission may be obtained from the Admissions Office, 131 Arlington Street, Boston, Massachusetts 02116. Out-of-state and foreign applicants should return their completed forms *before* February 1, and in-state applications should be returned *before* March 1. *No application fee is required.*

Applicants are invited to visit the campus where group meetings for visitors are held most Tuesday, Wednesday and Thursday afternoons at 3 p.m. This is an appropriate time to tour the campus and ask questions. An applicant should be assured, however, that if he is unable to visit Boston his application will be in no way disadvantaged.

A personal conference may be scheduled if the University deems it necessary or if the candidate or his guidance counselor has a question that cannot readily be resolved otherwise.

TESTING PROCEDURE.

All applicants must take the Scholastic Aptitude Test given by the College Entrance Examination Board. The University requires three College Board Achievement tests, including English Composition. All College Board Test reports must be sent directly to the Admissions Office, 131 Arlington St., University of Massachusetts, Boston, Massachusetts 02116, from the College Board Testing Center. The applicant himself must notify the Board that he wishes his scores sent to this University. Veterans who have been out of high school for two or more years should take the above College Board Tests again.

Foreign students should contact the Admissions Office for specific information about testing required of them.

ACKNOWLEDGEMENT AND NOTIFICATION.

In most cases applicants will be notified by letter during April of the action taken on their applications. Applicants who present strong academic records, enthusiastic school recommendations, and satisfactory College Board scores will receive earlier notification. This early notification should reassure the well-qualified applicant regarding college entrance and enable the student who has

selected the University as his choice of college to settle his plans. Applicants accepted at an early date, however, are under no pressure to make a final decision in regard to their choice of college before the Candidate's Reply Date. In this way the burden of multiple applications on high school guidance counselors and college admissions officers may be lessened.

ADVANCED PLACEMENT.

Students whose scores on Advanced Placement examinations meet standards determined by the University shall be regarded as meeting the equivalent University requirements. The College Entrance Examination Board Advanced Placement examinations or special examinations given by the University will determine advanced placement.

Students who wish to continue the study of a language in which they have had previous training are required to take an appropriate placement test. Placement tests are administered by the University prior to registration for the fall terms. Students will be placed at the level of study indicated by the results of the tests; the intermediate level requirement may be met by achieving an adequate score.

TRANSFER STUDENTS.

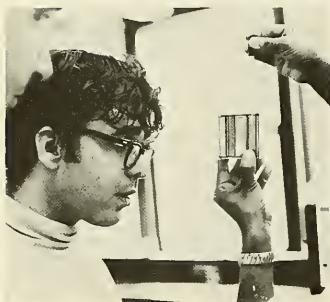
A limited number of transfers from approved colleges may be admitted. Since applicants for transfer exceed the number that can be accepted, they are placed on a competitive basis. Evaluations will be based upon high school and college records and on the College Board Scholastic Aptitude Tests, which are required of all transfers. Any student who has been previously enrolled in a college is considered a transfer and must file a transfer application form. Applicants for transfer should write to the Admissions Office for a Transfer Application.

All transfer students who are candidates for a Bachelor's Degree must take at least 45 semester credits in residence as well as fulfill all University requirements for graduation.

As a part of the Massachusetts system of higher education, the University recognizes its kinship with the regional Community Colleges and therefore guarantees that the student who has completed the Community College transfer program, is fully qualified, and has the recommendation of the Community College, will be accepted for transfer into the four-year program. Appropriate courses given at the Community College will be fully accepted for transfer credit and applied to core curriculum requirements where possible.

Special Admissions

The Special Admissions Office seeks to attract students from minority group backgrounds and those who for financial reasons might not consider applying to college at all. Most of the students are older and have worked at jobs for several years. In order to apply, a student must show significant financial need. All students accepted by the Special Admissions Office are full-time degree candidates



under the same obligations as all other students who come to the University.

Each student who applies through Special Admissions must submit, along with his application, two informative letters of recommendation from those familiar with his work, either on a job, in school, or in connection with a project he has pursued in the community; and a high school transcript. Students who have not completed high school are encouraged to consider applying, provided they have had an equivalent work experience or have read widely. After completion of the application, an interview should be arranged. The purpose of the interview is to give the counselor some idea of the applicant's interests, his hopes for the future, his past experiences—in an effort to help both the counselor and the student decide whether or not the application to the University makes sense.

In the Spring, open meetings are held for prospective students to discuss Special Admissions and the University in general. Further questions can be answered directly by the Special Admissions Office, 617-542-6500, ext. 527, 528. All applications should be addressed to Mrs. Jancie Crawford or Mr. Livaughn Chapman, Special Admissions, University of Massachusetts, Boston, 100 Arlington Street, Boston, Massachusetts 02116. Students should apply *no later than* June 30 to assure September consideration.

Classification of Students

I. DEGREE STUDENTS.

Full-time—All students carrying 12 or more credits are accepted as degree candidates and assigned to a graduating class.

Reduced-Load Students—Full-time students may obtain exemption from minimum load requirements upon approval of the Advising Office. Such exemption is ordinarily granted on the basis of health, personal or academic reasons. Reduced-load students are considered as full-time in all benefits, fees and obligations. The semester is counted as one of the 10 semesters toward graduation. A regular student may not normally enter the non-classified degree status.

Non-Classified Degree Students—Students who are admitted to degree status on the same basis as full-time students, but with the expectation of only part-time pursuit of the degree are considered Non-Classified Students. They are given a classification of “NC”. For their initial enrollment they are classified as Freshmen or Transfers by the Admissions Office. They are assigned to an adviser for appropriate counseling and pre-registration advising.

Non-Classified Students are billed on the advice of the Advising Officer in the same manner as Special Students.

II. NON-DEGREE STUDENTS.

Special Students—A transient student accepted for courses on a non-continuing basis is assigned to this category (class designation is “SP”). No evaluation of transfer credentials or course advising is offered to students in this category nor are they entitled to any student benefits. Their continuance is not automatic but at the discretion of the Registrar’s Office based on grades attained.

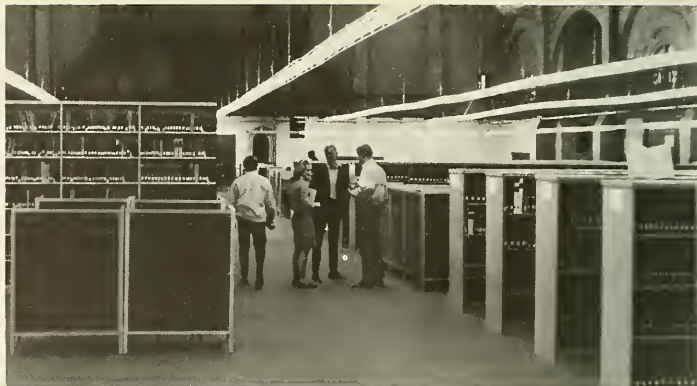
In order for a Special student to be reclassified as a regular student he must make an appeal through the Admissions Committee.

Tuition, Fees and Expenses

TUITION.

As a state institution the University of Massachusetts at Boston offers a low rate of tuition to all students entering from the Commonwealth. Eligibility for admission under the low residential rate is determined in accordance with the following policy established by the Board of Trustees.

A student must present evidence satisfactory to the Treasurer of the University that his domicile is in the Commonwealth of Massachusetts in order to be considered eligible to register in the University as a resident student. This means that he must have established a “bona fide” residence in the Commonwealth with the intention of continuing to maintain it as such.



The domicile of a minor shall follow that of the parents unless such minor has been emancipated. In case of emancipation, the student, in addition to the requirements of these regulations respecting residence, shall present satisfactory proof respecting emancipation. Minors under guardianship shall be required to present, in addition to the certification of the domicile of the guardian, satisfactory documentary evident of the appointment of the guardian. No student shall be considered to have gained residence by reason of his attendance in the University, nor shall a student lose residential preference during his continuous attendance at the University. The residence of a wife shall follow that of a husband. The prescribed form of application for classification as to residence status must be executed by each student. Misrepresentation of facts in order to evade the payment of out-of-state tuition shall be considered sufficient cause for suspension or permanent exclusion from the University. Discretion to adjust individual cases within the spirit of these rules is lodged with the President of the University.

EXPENSES.

Normally expenses vary from approximately \$350 to \$450 per year. The following estimate of a year's expenses includes only those items which are strictly college-related. Tuition for residents of Massachusetts is \$200 per year and for others \$600.

Tuition	\$200
Student Activities Fee	30
Health Services Fee	24
Student Medical/Surgical Insurance 12 months coverage optional	30
Books, stationery, laboratory and other supplies (estimate)	100
	\$384

There is no provision made for room and board expenses as the University of Massachusetts of Boston is non-residential.

INITIAL PAYMENT FOR FRESHMEN.

The initial payment for first semester expenses required of freshmen and transfer students prior to fall registration, and other expenses reasonably expected, are indicated below:

	<i>Residents of Massachusetts</i>	<i>All Others</i>
Tuition	\$100	\$300
Less Credit for Matriculation Fee	(15)	(15)
Net Tuition	85	285
Student Activities Fee	15	15
Health Services Fee	12	12
Student Medical/Surgical Insurance		
12 months' coverage (optional)	30	30
Total of first semester Student Fee Bill	\$142	\$342
Books, Stationery, Laboratory and other		
supplies (estimate)	50	50
Total	\$192	\$392

The figures for books, stationery, etc., are approximate; they vary depending upon courses chosen and individual needs. Students should be prepared to pay cash for books and incidental supplies. Certain departments make special charges for necessary laboratory supplies. A bill will be rendered to the parent of each student prior to the beginning of the semester.

STUDENT ACTIVITIES FEE.

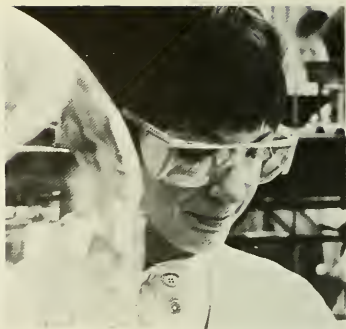
Used to support programs and activities beneficial to students, such as the recognized student organizations and the University Cultural Events Committee.

STUDENT HEALTH FEE.

Used to support the University Health Services and its programs.

MEDICAL/SURGICAL INSURANCE.

An optional plan providing hospital, medical, and surgical care on a twelve-month basis for injuries or illness during the school year, holidays and summer vacation. Students who register for the Fall semester have only one opportunity to enter or reject this program each year, at the time of payment of the Fall semester bill. It is also offered on the Spring semester bill for new Spring registrants only. Dependents of married students are not covered under this plan. Coverage for dependents is available at additional cost. Inquire at the Student Affairs Office.



PAYMENT DUE DATES.

In accordance with University policy all charges for tuition and fees are due and payable approximately 21 days prior to the date of registration of each semester. Bills will be rendered in advance with due date shown and should be returned with the proper payment to the Office of the Treasurer, University of Massachusetts at Boston, 100 Arlington Street, Boston, Massachusetts 02116. Students may not register until all University charges are paid or otherwise accounted for.

SCHOLARSHIP PAYMENTS.

It is the responsibility of all scholarship holders to see that the University is adequately notified prior to the time fee bills are prepared. Known scholarships are shown on the fee bills. If such items are not shown, deductions may not be made from the bill until satisfactory evidence has been presented to the Treasurer of the University by the donor.

LATE PAYMENT AND REGISTRATION.

Any student who does not make payment of his semester charges by the date specified may be required to pay a late payment fee of \$5.

TUITION AND FEE REFUNDS.

A student who leaves the University for any reason, except as specified below, before a semester is completed will be granted a pro rata refund of tuition and fees. A student who makes an advance payment and then for any reason does not attend any part of the next semester or term at the University will be given a full refund of tuition and fees. The \$15 admission (matriculation) payment required of new students is not refundable. A student called into military service before completion of a semester will be given a pro rata refund of tuition and fees provided that he receives no academic credit for the work of that semester. If academic credit is given, there will be no refund. A student who is suspended or expelled from the University for disciplinary reasons forfeits all rights to a refund.



REFUND SCHEDULE.

Regular Term

- | | |
|---|-----------|
| a. Within the first two weeks from the beginning of semester or term (Registration Day) | 80% |
| b. During the third week | 60% |
| c. During the fourth week | 40% |
| d. During the fifth week | 20% |
| e. After the fifth week | no refund |

Refunds are based upon the withdrawal date established by the Registrar.

Veterans

Any veteran whose service is credited to the Commonwealth of Massachusetts (i.e., Massachusetts resident at time of entry into service), and who has served 180 days active duty since February 1955, is eligible to attend the University tuition free. Instructions relative to the procedure to obtain this tuition waiver are available at the Registrar's Office. This tuition waiver covers a period of four years but must be renewed each year. Summer school attendance must have a renewal of the tuition waiver but is not charged as a renewal if the courses taken in summer school are required for a degree.

Information concerning veterans status and payments under Federal and State laws is available at the Office of Student Affairs.

Certificates of eligibility for schooling are issued by the Veterans Administration upon application by the veteran. Upon receipt of the certificate of eligibility, the veteran should deliver it to the Registrar's Office for processing.

Responsibility for any change in status rests with the veteran. Any change in a veterans status while attending the University in relation to semester hour credits, marriage, dependents or withdrawal should be reported immediately to the Registrar's Office.

Financial Aid

Financial Aid at the University of Massachusetts at Boston is awarded to those students who cannot provide the full cost of their college education through their own and their families' reasonable efforts. The term "financial aid" is used to include scholarships, grants, long-term loans and part-time employment.

Applications for financial aid should be filed at the same time as the application for admission. The filing of an application for financial aid will have no influence on the decision for admission.

All awards are made on an academic year basis only. A student must apply each year for any type of aid for the following year.

SCHOLARSHIPS.

Commonwealth Scholarships are available for residents of Massachusetts. Only those students in the top 10-25 percent of their class with above average performance on the College Entrance Examination and a financial need will be considered for scholarships.

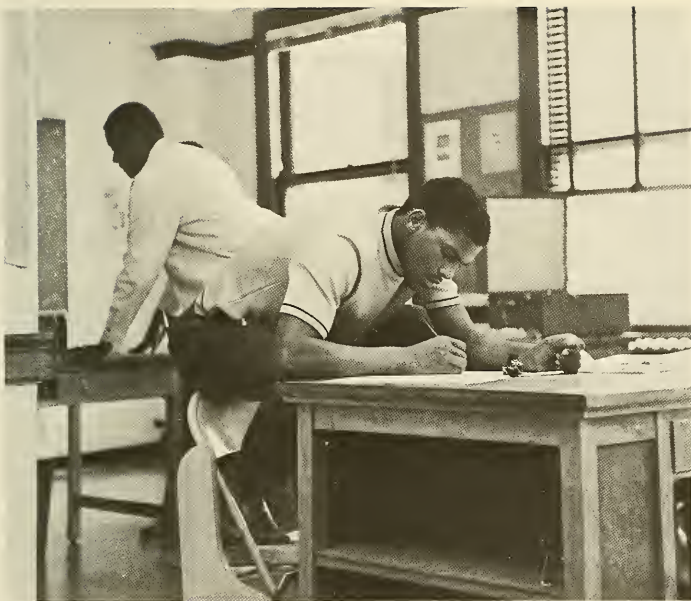
EDUCATION OPPORTUNITY GRANTS.

These gift awards are given to academically promising students in accordance with special requirements set by the Higher Education Act of 1965. These grants are designed especially for students of low income families.

LOANS.

The major sources for loans are the National Defense Student Loan Fund and Federally supported State Guaranteed Loan Programs.

- a. National Defense Student Loans are available through Federal funds received by the University. Federal legislation permits students needing money to borrow up to \$1,000 per year for five years. The actual amount of the loan is determined by the student's needs and by the amount of Federal funds made available to the University. No interest is charged on loans until repayment begins. The repayment period starts nine months after the student ends his studies, and may be extended over a 10-year period at an interest charge of 3 percent on the unpaid balance. Repayment of capital and interest may be deferred up to a total of three years while a borrower is serving in the Armed Forces, with the Peace Corps, or as a Volunteer in Service to America (VISTA). Also, no payments are required as long as the student remains at least a half-time student at the undergraduate level. There are provisions for cancelling all or part of this loan if the student enters the teaching profession.
- b. Students may apply for loans under the Guaranteed Loan Program in their home states. This program, established by the Higher Education Act of 1965, varies from state to state. Generally, undergraduate students may borrow up to \$1,000 per academic year with a total maximum of \$5,000, while a graduate



student may borrow up to \$1,500 per academic year; the total sum of \$7,500 for one student's undergraduate and graduate study may not be exceeded. Commercial banks, mutual savings banks, savings and loan associations, credit unions and other financial institutions subject to Federal or State supervision may be lenders under this program. A student should make application directly to one of these participating institutions, preferably to one located in the city or town of his permanent residence. The University is asked to certify the enrollment and good academic standing of the student, the reasonableness of his college expenses, and the amount of financial aid available from sources other than his family. These loans are considered a part of the financial aid package.

If the borrower's parents have an adjusted gross income of less than \$15,000 at the time he makes the loan, he need not pay interest until the repayment period begins, and then pays the regular 7 percent on the unpaid balance. Repayment begins nine to twelve months after the borrower has completed his studies and may be deferred while he serves in the Armed Forces or the Peace Corps. The repayment period may be five to 10 years on loans of more than \$2,000 and one to five years on loans less than \$2,000.

PART-TIME EMPLOYMENT.

This employment is available mainly through the College Work-Study Program, part of which is supported by the Federal Work-Study Program, and will be given as part of the financial aid package. This will require eight to 15 hours of work per week for students who need financial aid. Students are paid bi-weekly for the hours that they have worked.

APPLICATION PROCEDURE.

Two separate steps are required to complete an application for financial aid at the University of Massachusetts at Boston.

- a. A pre-Freshman or Transfer student should complete the Financial Aid Application form and return it no later than March 1, or within two weeks if he receives it after February 15.
- b. The applicant should obtain from his school's guidance office, a copy of the Parent's Confidential Statement prepared by the College Scholarship Service. That statement should be mailed directly to the Service at the same time the application form is sent to the school. The University of Massachusetts at Boston should be listed under item 13. If the school does not have a copy of the Parent's Confidential Statement, one should be requested from the College Scholarship Service, Box 176, Princeton, New Jersey.

AWARDS.

The amount of awards is determined by degree of need and may range from \$100 to full cost of attending school. A fuller explanation of determination of need is available in the Financial Aid Office.

Announcement of awards will be made by means of an award letter as soon as possible following the applicant's acceptance by the University. Further communication with the Financial Aid Office is unnecessary, as each applicant will receive an answer as soon as a decision has been made.

University Health Services

The medical care provided by the University Health Services is structured primarily for the well-being of the student population at the University of Massachusetts at Boston. The program is student-oriented, and the services offered are those which have a real meaning for the student. The services exist to help minimize loss of student time and energy from educational pursuits for reasons of health. Two registered nurses are on duty from 8:30 a.m. to 5:00 p.m., and both clinical and laboratory facilities are offered. Physicians and psychiatrists are available on an appointment basis, and special consultants are arranged when necessary.

The physical examination and medical history of each student is reviewed by a physician before registration. The University Health Service is aware, therefore, of any pre-existing medical problems which either require medical care or

might necessitate a modification of the student's academic or athletic program. All medical records are held in the strictest confidence by the University Health Services.

The Health Services are supported by the Health Service Trust Fund into which each student pays \$12 a semester. Students are urged to enroll in the University of Massachusetts/Boston Paige, O'Brien, Russell Student Insurance Plan. This fee entitles the student to extensive but not total hospital services, in-patient physicians' care, out-patient surgical care, accident insurance, etc. Students are covered both on and off the campus for the entire year even if they withdraw from the University. A full description is available at the University Health Services office.



Housing

The University of Massachusetts at Boston is a commuting institution. As such, living arrangements are the sole concern and responsibility of the students and their parents. It is not the policy of the University to assist in housing.

Office of Student Affairs

The Office of Student Affairs includes, either completely or in cooperation with other offices, the following areas:

Career planning	Intramural athletics
Communication with parents	Orientation program
Counseling	Placement
Cultural events programs	Recognized student organizations
Discipline	Student activities
Financial aid	Veterans' affairs
Foreign students	
Handicapped students	

For further details, students are urged to consult the Student Handbook.

Advising and Study Counseling

The staff of the Advising Office is available to students to provide them with information on the curriculum, general requirements and program planning. Tutorial and study skills assistance is available to students through this office. Small classes in basic writing techniques and in reading skills are established each semester. Group tutorials are available in the core courses such as Mathematics, Languages and Natural Sciences. Students and faculty members should contact the Advising Office for further information on both types of programs.

All freshman are advised by members of the Board of Freshman Advisers; upperclassmen are advised by faculty members in their major departments. Students undecided on a major should consult with a member of the Advising Office staff.

Career Planning and Placement

The services of the Career Planning and Placement Office of the University are available to all registered students and alumni.

The principal services provided by this office are:

- Individual and small group counseling,
- Off-campus part-time employment,
- Full-time graduate placement,
- Occupational and career information library, and
- Graduate school catalog library.

A program of on-campus recruitment, which will be of service primarily to graduating seniors and alumni, is being established.

All students, regardless of year in school, are encouraged to register with the Career Planning and Placement Office and to share with members of the staff emerging concerns and questions relevant to their future plans.

Grades

Grades shall be reported according to the following letter system. No other interpretation of this letter system shall be authorized.

- A—Excellent
- B—Good
- C—Fair
- P—Passing-Satisfactory (pass/fail option)
- D—Conditionally Passing—Unsatisfactory
- F—Failure
- Inc.—Incomplete

The grade of Incomplete shall be reported only when a portion of the assigned or required class work, or the final examination, has not been completed



because of the student's serious illness, extreme personal circumstances, or for scholarly reasons at the request of the instructor. If the student's record is such that he would fail the course regardless of the result of the missing work, he shall fail. A student can obtain credit for an Incomplete only by finishing the work of the course within the first two weeks of the following semester. The grade of Incomplete is converted to a failure if the course requirements have not been satisfied by that time. Exceptions to the two-week deadline may be requested from the appropriate agency in cases of protracted illness, critical personal problems, or for scholarly reasons at the request of the instructor. The initiative for removal of the Incomplete grade rests with the student.

An Incomplete on a final grade report is calculated as an F in arriving at a temporary quality point average. When the Incomplete is later converted to a grade, the permanent record is changed and the student is notified.

Once a grade is submitted, it cannot be changed except on approval of the Department Chairman.

PASS/FAIL OPTION.

A student may elect one course each semester to a maximum of eight on a pass/fail basis provided he presents a P/F Option card to the Registrar's Office before the mid-term. The grade of Pass will be included in the graduation credits but not in the quality points or cumulative average.

QUALITY POINTS.

Quality points are assigned to course grades as follows: A, 4; B, 3; C, 2; D, 1; F, 0. The quality points for each grade are multiplied by the number of credits for the course, and the totals for all courses are added to arrive at the number of cumulative quality points. The number of cumulative quality points is divided by the number of cumulative credits carried to arrive at the cumulative quality point average.

RETENTION AND GOOD STANDING.

Cumulative Index Required For Retention

<i>Semester</i>	<i>Credits</i>	<i>Cumulative Average Retention</i>
1	16	0.0
2	32	1.3
3	48	1.5
4	64	1.6
5	79	1.7
6	94	1.8
7	109	1.9
8	124	2.0

Academic Dismissal

A student whose cumulative average falls below the requirement for retention will receive an academic dismissal.

Scholastic Probation

A student will be placed on scholastic probation if his semester average is below 1.5 after any of the first three semesters or below 2.0 after any of the subsequent semesters.

Any student who is at the probation level shall be warned by a statement on the bottom of his copy of the grade report. This warning is to indicate that continued below-standard performance will result in failure to graduate or in academic dismissal.

Probation precludes participation in student government and student activities for the following semester.

Readmitted Students

A readmitted student must attain the cumulative average required by the class to which he has been assigned at the time of readmission.

Transfer Students

The former cumulative average of a transfer does *not* carry over to this University, he begins a new cumulative average upon admission. Therefore the cumulative average for the second semester necessary for retention is the same as for a freshman (i.e., 1.3 for retention). However, for all subsequent semesters, the student must attain the cumulative average necessary for the class to which he was assigned.

Probation Appeals

The Committee on Standards and Scholarship shall be charged with modifying, extending, or limiting the restrictions on a student during a period of scholastic probation and determining the limit of its duration. The Committee shall report all such modifications to the Faculty Senate.

Failed Courses

A failed course in a subject required for the degree must be repeated. If the failed course is not required, a substitution may be made upon the approval of the student's adviser. Although repeated, the original failed course continues as part of the student's quality point average and course record.

A course once passed may not be repeated for a higher grade.



COURSE CHANGES—FIRST TEN ACADEMIC DAYS.

1. Add Period—The student is allowed ten academic days from the beginning of the semester to add, drop, or substitute a course without notation on his record.
2. Add/Drop Procedure—If a student has good reason to drop one course and add another, he may accomplish this in the following order:
 - a. Secure a Change of Course card from the Registrar's Office.
 - b. Have the instructor of the course to be added certify that space is available in the desired section.
 - c. Secure release from the instructor of the course to be dropped.
 - d. Submit the completed Change of Course card to the Registrar's Office.
3. Withdrawal—If the student simply wishes to withdraw from a course (within the first ten days) he may do so with his instructor's approval, using the following procedure:

Obtain a Change of Course card from the Registrar's Office. Obtain the necessary signatures and return the card to the Registrar's Office.

COURSE CHANGES—WITHDRAWAL AFTER 10TH ACADEMIC DAY.

1. Withdrawal Period—Within the period of the 11th academic day and up to the day before the beginning of the examination period, a student may drop a course subject to minimum load regulations (12 credit hours for matriculated student). The notation of withdrawal on the student's record will be the grade of "W" which is not computed in the grade point average.
2. Withdrawal Procedure—(11th to day before examination period) To be properly withdrawn from a course the student must accomplish the following:
 - a. Secure a Change of Course card from the Registrar's Office.
 - b. Schedule a conference with the instructor of the course involved and with his adviser.
 - c. Secure recommendations from the instructor and the adviser. They should indicate their recommendations on the card next to their signatures.

Withdrawal From the University

1. If a student withdraws prior to the date of the first final examination, no grade will be recorded in his permanent record file. The courses in which he was enrolled will be recorded along with his withdrawal date.

The effective date of withdrawal is that on which all proper forms are completed, signed, and returned to the Registrar.
2. Withdrawal Procedure—To withdraw from the University, the student must do the following:
 - a. Consult with a member of the Advising Office staff, who will provide and sign the necessary papers.
 - b. Receive clearance from all departments of the University where he may have accrued charges, e.g., Library, Laboratories, Health Services, Treasurer's Office, Student Affairs Office, Book Store. This will clear the student's records so that he may get appropriate refunds and/or transcripts.
 - c. Return all forms to the Registrar for final approval.
3. If any charges are outstanding, the student's permanent records will be "frozen" and no transcripts can be issued. Withdrawal papers which are not completed will result in the recording of the grade of F in all courses at the conclusion of the semester.

Change of Major

Any student who has stated a major and wishes to change it should consult first with a member of the Advising Office staff. Upon approval of the change, the departments involved and the Registrar's Office will be notified, and the student will be assigned a new adviser by the new department.

Conduct

The customary high standard of college men and women in honor, self-respect, and consideration for the rights of others constitutes the ideal student conduct. The privileges of the University will be withdrawn from a student at any time if such action is deemed advisable. It should be understood that the University, acting through its President or any administrative officer designated by him, distinctly reserves the right not only to suspend or dismiss students but also to name conditions under which they may remain in the institution. Hazing in the sense of the punishment or humiliation of students is not permitted. The University of Massachusetts at Boston does not authorize or recognize any social fraternities or sororities.

Summer Courses Outside the University

In order to receive credit for summer course work outside the University a student must receive prior authorization from the department concerned for each course to be taken. A Course Authorization form can be obtained from the Registrar's Office; the original to be returned to the Registrar, one copy to be retained by the Department, and one copy to be retained by the student. In general, a grade of B or higher is required for transfer credit in courses which normally could be taken during the regular school year. Permission to accept a grade lower than B can be obtained only from the Department to which the credit is being transferred. It is the student's responsibility to see that a transcript is sent to the Registrar upon completion of the program.

Final Examinations

When the examination schedule is published, any student who finds himself scheduled for two examinations at the same time or for three examinations in one day should report the situation directly to the Registrar.

Attendance

The attendance regulations place the responsibility for class attendance upon the individual student. *He is expected to attend classes regularly and punctually.* The members of the student body are considered sufficiently mature to accept this personal responsibility, and to recognize and accept the consequences of failure to attend. Since freshmen must exercise particular care in this respect and since the faculty recognizes its greater responsibility toward them in the matter of class attendance, it is expected that freshmen, especially, will attend all their classes. The attendance of freshmen and students on probation is subject to special review by the Dean.

Members of the faculty will hold these students responsible for regular attendance at classes. After the second week of the semester, if a student has been

absent in any course for twice the number of weekly class hours, the instructor is required to report such absences to the Dean.

It is recommended that all absences due to illnesses be reported to the University Health Services. Although students are expected to deal directly with faculty members, the Health Services will verify dates of absences by telephone, Extension 324, if requested by faculty members.

Any student in good standing absent for more than twenty-five consecutive class days, for health or any other reason, will generally be required to withdraw from all courses that semester.

Honors Programs

To graduate with Departmental Honors, a student must have either: (1) successfully completed some special honors work, such as a thesis or seminar; or (2) gained a 3.5 grade average in his major field, the awarding of honors not to be automatic, however, but to depend on the recommendation of an honors committee in his department.

The student must, in addition, have a 3.0 overall grade average. (Note that this governs *graduation* with honors, not admission to honors work, which is left to the discretion of the departmental honors committee.)

Not more than 6 credits may be received for special honors work.

If a student entered in an honors course completes the work satisfactorily but not on an honors level, he shall receive credit for the course toward graduation.

BRIAN RATTIGAN PRIZE.

A cash award made annually for outstanding creative achievement. Established by his friends and classmates in memory of Brian Rattigan, a poet and member of the first graduating class of the University of Massachusetts at Boston, who drowned during the summer before his Senior year. Selection of the recipient is made by a special committee of faculty and students.

LUIS EMILIO SOTO PRIZE.

Awarded each Spring at the Commencement Exercises to the Senior majoring in Spanish who best reflects the humanistic qualities and the spirit of Professor Soto.

The prize was inaugurated in May, 1970, and is named for Professor Luis Emilio Soto (1902-1970), who, in his short stay at the University of Massachusetts at Boston, wholly won the hearts of his students and colleagues by his devotion to them and to their work.

Course Load

The normal course load for Freshmen and Sophomores is four courses for 16 credit hours and for Juniors and Seniors, five courses for 15 credit hours. A student with a cumulative grade average of 3.0, or 3.5 in the previous semester,



may take an extra course with the permission of his adviser.

A student majoring in a Science who must take laboratory courses of more than 4 credits may assume a load of 18 credits. This is intended especially for Juniors and Seniors who may find it necessary to take three 3-credit courses, a required 4-credit core curriculum course, and a 5-credit laboratory course (or a similar variation) in one semester.

Students may elect to plan a four-year (eight semester) or five-year (10 semester) program.

Graduation Requirements

In order to graduate, a student must acquire a total of 124 credits to include:

1. Freshman-Sophomore core curriculum requirements,
2. requirements for a major field, and
3. the upperclass distribution requirements.

NOTE: Students who qualify for advanced placement in languages or other 4-credit Freshman-Sophomore courses may graduate with as few as 120 credits.

BASIC CORE REQUIREMENTS FOR GRADUATION

- a. Two semesters of Freshman English; not postponable by anyone.
- b. Two semesters of Freshman History. This may be postponed to the Sopho-

more year by Mathematics and Natural Science majors who are taking a foreign language in their Freshman year.

- c. Four semesters of Natural Sciences or Mathematics, not more or less than two in the same department. Two semesters of this requirement may be postponed to the Junior year by Mathematics, Humanities and Social Science majors.
- d. Four semesters of one language (or proficiency at the intermediate level). Beginning language courses may be postponed to the Sophomore year by majors in Mathematics and Natural Sciences. In any case, all four semesters must be taken *consecutively*. Students majoring in the Humanities are required to take the equivalent of five semesters of one language (one semester beyond the intermediate level).
- e. Two semesters of Sophomore English or one semester of Sophomore English plus a Humanities option which allows the student with his adviser's permission to substitute for English 112 a semester course in Art, Music, Philosophy, or Modern European Literature in Translation. The Humanities option may be postponed to the Junior year by Mathematics and Natural Science majors.
- f. Two semesters of introductory (Sophomore) Social Sciences. This may be postponed to the Junior year by Mathematics and Natural Science majors.

Thus, the usual Freshman program is:

English

Foreign language

History

Science or Mathematics

(except for postponements allowed to Mathematics and Natural Science majors)

The usual Sophomore program is:

English

Foreign language

Introductory Social Science (not History)

Science or Mathematics

(except for postponements allowed as outlined above)

UPPERCLASS DISTRIBUTION REQUIREMENTS

In addition to the core requirements and the requirements of their major department, students must fulfill a distribution requirement amounting to four semesters of work. These four semesters do not have to be in different departments provided all the conditions listed below are fulfilled:

- 1. All four semesters must be outside the major *department*.
- 2. Two must be outside the *division* in which the major falls.
- 3. Two must be *beyond* the introductory level.
- 4. One must be in *Humanities* and not used to fulfill basic core requirements. Fifth-semester literature courses in a foreign language, required of Humanities majors, may be used toward satisfying this requirement.



Courses and Major Requirements

Humanities

ART

RENEE M. ARB, PH.D., *Associate Professor of Art and Acting Chairman of the Department*; ROBERT KNOTT, PH.D., *Assistant Professor of Art*; HAROLD THURMAN, M.A., STEVEN TREFONIDES, *Resident Artists*; SUSAN BUSH, PH.D., GABRIEL GABELLA, M. ARCH., DANIEL MCCALL, PH.D., ELIZABETH MONGAN, B.A., *Part-time Lecturers in Art*.

GRADUATION REQUIREMENTS

Majors in Art History are required to take Art 111, Art 101 -02, and a minimum of eight advanced courses, representing at least three historical eras, from the following groups:

Group A: covers problems in drawing, graphic arts, sculpture, and architecture;

Group B: includes the exploration of a given style, period, master or group, iconographical problem, or comparative study of a theme which extends through more than one historical period.

The Department strongly recommends that majors also take one of the introductory studio courses.

With permission of the Department, honors students may substitute a senior thesis for one or two of the advanced courses.

COURSE OFFERINGS

CREATIVE ART

131 (1) BASIC DESIGN

The elements of visual form organized on the two-dimensional plane; line, shape, volume, color, texture, etc. Exercises, lectures and discussions dealing with color theory and

phenomena, space perception, composition, and form-content relationships.
6 hours, 3 credits Mr. Thurman

132 (II) THREE-DIMENSIONAL DESIGN

The fundamental visual elements of three-dimensional form. Material/tactile qualities, mass, volume, kinetics, and their structural organization explored in exercises, lectures, and discussions.
6 hours, 3 credits Mr. Thurman

133 (I) INTRODUCTORY DRAWING

Basic materials and techniques, with emphasis on drawing as a primary means for the description and interpretation of man and his environment. Problems in still life, landscape and life drawing; exercises in imaginative composition.
6 hours, 3 credits

Mr. Trefonides, Mr. Thurman

233 (I), 234 (II) WORKSHOP IN DRAWING

Problems in a number of drawing media (ink, charcoal, pencil, chalk, etc.) approached through work with still-life, landscapes, and the human figure.
6 hours, 3 credits

Prerequisite: Art 131 and 133 or permission of instructor Staff

235 (I), 236 (II) WORKSHOP IN PAINTING

Problems in the various painting media (oil, opaque, watercolor, acrylics) working from still-life, figure and landscape.
6 hours, 3 credits

Prerequisite: Art 131 and 133 or permission of instructor Mr. Trefonides

HISTORY OF ART

101 (I), 102 (II) INTRODUCTION TO THE HISTORY OF ART

A survey of the major periods of national and individual styles in painting, sculpture and architecture from antiquity to the 20th century, with analysis of original material in the local museums.
3 hours, 4 credits Staff

111 (I, II) INTRODUCTION TO THE LANGUAGE OF ART

The nature of form, content, technique, and style in painting, sculpture, architecture and graphic arts. Designed to sharpen the student's response to original works. Museum meetings alternated with lecture/discussions on key problems.
3 hours, 4 credits Staff

203 (I) THE ART OF GREECE

Greek art from the geometric through the Hellenistic periods, with the development of sculpture as the central theme.
3 hours, 3 credits

Prerequisite: Art 111 or permission of instructor Mr. Ramage

204 (II) THE ART OF ROME

The painting, sculpture, and architecture of Rome and the Provinces from the Republican era to Constantine the Great; the influence of the emperors as a unifying element.
3 hours, 3 credits

Prerequisite: Art 111 or permission of instructor Mr. Ramage

205 (I) INTRODUCTION TO ITALIAN RENAISSANCE PAINTING

The creation and flowering of the early Renaissance style in Florence. Masaccio, Fra Angelico, Piero della Francesca, Botticelli and Leonardo da Vinci, among others; their relationship to the different esthetic and intellectual responses in the various local centers.
3 hours, 3 credits

Prerequisite: Art 111 and Art 101, or permission of instructor Miss Arb

206 (II) ITALIAN RENAISSANCE PAINTING: THE GOLDEN AGE

A definition of High Renaissance classicism and of the particular form the style took in Rome and Venice in the first three decades of the 16th century. Concentration on the careers of Raphael, del Sarto, Michelangelo, Giorgione, Titian and Correggio, with reference to relevant lesser personalities.
3 hours, 3 credits

Prerequisite: Art 111 and 101, or permission of instructor Miss Arb

207 (I) NORTHERN ART FROM PUCELLE TO DUERER

An overview of the major trends and individual artists appearing in Northern Europe from the 14th to the 16th centuries. The development and interrelationships of such important figures as van Eyck, van der Weyden, Bosch, Grunewald, Bruegel, Duerer and Claus Sluter.
3 hours, 3 credits

Prerequisite: Art 111 and 101 or permission of instructor
Not offered 1970-71

209 (I) ART OF THE BAROQUE

A panorama of the visual arts of Italy, Spain, France, Holland and England considered in relation to the expanded social and geo-

graphical horizons of the 17th century.

3 hours, 3 credits

Prerequisite: Art 111 and 101 or permission of instructor

Not offered 1970-71

221 (I) 19TH CENTURY ART

A broad survey of the visual arts stressing the vigorous counterpoint of esthetic and social forces during a century of dynamic change. Emphasis on European painting.

3 hours, 3 credits

Prerequisite: Art 111 and 102, or permission of instructor Mr. Knott

222 (II) 20TH CENTURY ART

An introduction to the multiple innovations of style, theory, materials and techniques in the art of this century, and to the leading European painters and sculptors. Concentration on the first four decades when cubism, expressionism, fauvism and surrealism were developed.

3 hours, 3 credits

Prerequisite: Art 111 and 102 or permission of instructor Mr. Knott

Not offered 1970-71

225 (II) INDIAN ART AND ITS INFLUENCE

The sculpture, architecture, and painting of India and their influence in the Far East and Southeast Asia, including an introduction to the religious background of Buddhism and Hinduism.

3 hours, 3 credits

Prerequisite: Art 111 or permission of instructor Mrs. Bush

226 (II) CHINESE PAINTING

The evolution of Chinese painting into a unique art form and its theory and social implications.

3 hours, 3 credits

Prerequisite: Art 111 or permission of instructor Mrs. Bush

Not offered 1970-71

227 (I) THE ART OF AFRICA

An introduction to the African arts (especially carved figures, masks, rock and wall paintings, textiles and ritual objects) studied in relation to the ethnic background as well as esthetic expression. Art historical problems within the continent and the impact of African forms on other cultures of the 19th and 20th centuries.

3 hours, 3 credits

Prerequisite: Art 111 or permission of instructor Mr. McCall

228 (II) AMERICAN PAINTING AND SCULPTURE

Concentrates on the period between the Armory Show (1913) and the present. Discussion of major 19th century American artists and their relationship to currents of European art and taste.

3 hours, 3 credits

Prerequisite: Art 111 and 102, or permission of instructor Mr. Knott

229 (I) FAR EASTERN PAINTING

The relationship of Chinese and Japanese painting, stressing the special characteristics of each. Scroll paintings, screens, and Japanese prints are discussed.

3 hours, 3 credits

Prerequisite: Art 111 or permission of instructor Mrs. Bush

241 (I) ORIGINS AND DEVELOPMENT OF WESTERN ARCHITECTURE

The evolution of architecture from its beginnings in Mesopotamia, Egypt and Greece through its development in the Renaissance and Baroque periods, with special attention to the relation of man and environment, the articulation of space, and the theory of architectural design.

3 hours, 3 credits

Prerequisite: Art 111 or permission of instructor Mr. Gabella

242 (II) MODERN ARCHITECTURE

Problems in the theory of architectural design during the era of Romantic Classicism and the evolution of new potentials in the 19th century. The role of technology, new structural solutions, methods of construction, and the development of new conceptions of space for contemporary buildings.

3 hours, 3 credits

Prerequisite: Art 101, 241 or permission of instructor Mr. Gabella

304 (II) CLASSICAL PAINTING

The style and technique of Greek vase painting, wall painting and easel painting, with emphasis on literary tradition.

3 hours, 3 credits

Prerequisite: Art 203 or permission of instructor Mr. Ramage

308 (II) MANNERISM IN THE VISUAL ARTS, 1520-1600

An exploration of the new style developed in Italy in reaction to Raphael's classicism which spread to Northern Europe between the High Renaissance and the Baroque. Form, theory and content in relation to the social crises of the Reformation and the

Counter-Reformation. The 'psychology' of Mannerism and its relationship to the modern age.

3 hours, 3 credits

Prerequisite: Art 10I, 206 or permission of instructor
Miss Arb

309 (I) MASTERS OF BAROQUE PAINTING

A detailed examination of the work of six masters: Caravaggio, Velasquez, Poussin, Rubens, Rembrandt and Vermeer.

3 hours, 3 credits

Prerequisite: Art 111 and 10I or permission of instructor
Not offered 1970-71

310 (II) BERNINI, BORROMINI AND PIETRO DA CORTONA

The impact of Italian High Baroque style and theory on European taste of the 17th and 18th centuries, culminating in the northern Baroque of Germany and Austria and the French Rococo.

Prerequisite: Art 111 and 209 or permission of instructor
Not offered 1970-71

311 (I) THE CLASSICAL TRADITION IN WESTERN ART

The Greco-Roman tradition in art and philosophy in periodic re-appearances or revivals of classical style and theory from the Middle Ages through the period of the First Empire in France.

3 hours, 3 credits

Prerequisite: Art 111 and 10I or permission of instructor
Miss Arb

321 (I) SOURCES OF 20TH CENTURY PAINTING

A study of Cezanne, Van Gogh and Gauguin, the Symbolists and Art Nouveau, and the late 19th century break with the artistic premises of the Renaissance.

3 hours, 3 credits

Prerequisite: Art 111 and 102, or permission of instructor
Mr. Knott
Not offered 1970-71

322 (II) EUROPEAN PAINTING AND SCULPTURE, 1925-1940

Specific themes developed in this fifteen year period by the painters Picasso, Klee, Miro, Ernst, and the sculptors Brancusi, Moore, Arp and Lipchitz will be explored to show the relationship between the work of art and contemporary ideas in psychology, anthropology, and primitive mythology.

3 hours, 3 credits

Prerequisite: Art 111 and 102 or permission of instructor
Mr. Knott

Not offered 1970-71

391 (I) SEMINAR IN GRAPHIC ART

A close examination of original prints designed to develop knowledge of the technical processes (woodcut, engraving, etching, lithography) and their evolution, and to introduce the student to criteria of connoisseurship. Concentration on the leading masters such as Mantegna, Duerer, Rembrandt, Blake and Goya. Meetings in the Museum of Fine Arts, the Boston Public Library and the Fogg Museum.

Preference given to senior art majors.

Miss Mongan

392 LEARNING AND TEACHING OF ART IN THE SCHOOLS

The issues, principles and methods of teaching art in the schools. Supervision and critique of practice teaching.

3 hours, 20 hours laboratory (practice teaching), 9 credits.

Prerequisite: 6 hours Education courses and admission to Teacher Certification Program.
Staff

394 (II) SCULPTURE: FORM AND MEANING

An intensive study of the special qualities of the art of sculpture: types, techniques, function, iconography and style explored in lectures, discussions and field trips.

3 hours, 3 credits

Preference given to senior art majors.

Not offered 1970-71
Miss Arb

395 (I), 396 (II) SPECIAL PROBLEMS

Seniors planning graduate study may, in rare instances, be permitted to investigate a special area not covered by the course program. Regular conferences with a qualified professor as well as a long term paper will be required. A written prospectus must be submitted by the applicant and approved by the department chairman.

3 hours, 3 credits

CLASSICS

RENATA POGGIOLI, PH.D., *Assistant Professor of Classics and Chairman of the Department*; ROSEMARY BARTON, M.A., CLIVE FOSS, M.A., FRANCES C. KOHLER, M.A., BLAISE NAGY, M.A., *Instructors in Classics*; GERALD J. SULLIVAN, M.A., *Lecturer in Classics*.

GRADUATION REQUIREMENTS

Latin Major

Students majoring in Latin are expected to have a minimum of 24 credits in Junior-Senior level courses (four courses in Literature, two in Composition, two in Classics 331-32 or its equivalent). They are also required to take at least one year of the Greek language, preferably in their Freshman-Sophomore years.

Classics Major

Students majoring in Classics are expected to have a total of 30 credits: two courses each in Greek and Roman literature, plus Greek 241-42, and Classics 331-32 or its equivalent.

It is recommended that all majors in the Classics Department elect two courses in Ancient History or Greek Philosophy, or Greek and Roman Art, according to their objective.

At the end of their Senior year, students will take a General Examination on language proficiency and in a chosen field of literature.

A student standing for honors may choose to write an honors thesis on a subject approved by an instructor (see Classics 261).

COURSE OFFERINGS

LATIN

111 (I), 112 (II) ELEMENTARY LATIN
For students who have no creditable training in Latin. Intensive practice in language skills with introductory readings.
3 hours, 4 credits Staff

121 (I), 122 (II) INTERMEDIATE
LATIN

Review of reading skills. Selective readings in Latin literature.
3 hours, 4 credits
Prerequisite: Latin 112 or equivalent Staff

231(I), 232 (II) LATIN LITERATURE

Intensive readings of masterpieces of Latin literature, including epic poetry (Virgil), Catullus, and the Elegiacs.
3 hours, 3 credits
Prerequisite: Latin 122 or equivalent Staff

233 (I), 234 (II) LATIN LITERATURE
Intensive study of Ovid's *Metamorphoses* and Tacitus' *Annals*.
3 hours, 3 credits

Prerequisite: Latin 232 or equivalent Staff

235 (I), 236 (II) LATIN LITERATURE
Intensive study of Lucretius' *De Rerum Natura*, Cicero's *The Philosophical Work*.
3 hours, 3 credits

Prerequisite: Latin 232 or equivalent Staff

237 (I), 238 (II) LATIN LITERATURE
Horace's *Odes* and *Satires*, and readings in the Roman Theatre, including works by Plautus, Terence and Seneca.
3 hours, 3 credits

Prerequisite: Latin 232 or equivalent Staff

240 (II) LATIN LITERATURE: ROMAN
SATIRE

Reading of selected satires of Juvenal, epigrams of Martial together with an analysis of *Cena Trimalchionis*, *Ludus de Morte Claudii* and selected inscriptions.
3 hours, 3 credits

Prerequisite: Latin 122 or equivalent
Miss Barton

241 (I), 242 (II) LATIN
COMPOSITION

Composition; review of Latin syntax and structure; translations from English and original compositions.
3 hours, 3 credits
Prerequisite: Latin 122 or equivalent Staff

GREEK

111 (I), 112 (II) ELEMENTARY
GREEK

Fundamentals of the Greek language.
3 hours, 4 credits
Prerequisite: Latin 122 or equivalent Staff

121 (I), 122 (II) INTERMEDIATE
GREEK

Continued study of grammar and syntax. Readings include Plato's *Apology* and selections from other dialogues and from Homer's *Iliad*.
3 hours, 4 credits

Prerequisite: Greek 112 or equivalent Staff

231 (I), 232 (II) INTRODUCTION TO
GREEK LITERATURE

Plato and the Greek Tragedians.
3 hours, 3 credits
Prerequisite: Greek 121-122 Staff

241(I), 242 (II) ADVANCED GREEK READING AND COMPOSITION

Review of Greek syntax; reading of literary works with a stress on dialectical differences. Translation from English and original composition.

3 hours, 6 credits

Prerequisite: Greek 122 or equivalent Staff

CLASSICS

261, 262 HONORS THESIS

A substantive review of a subject approved by the individual instructor.

6 credits

Prerequisite: permission of department Staff

331 (I), 332 (II) GREEK AND ROMAN CIVILIZATIONS

A survey of the literature, philosophy and art of Greece and Rome in their historical setting. All readings in English.

3 hours, 3 credits Mrs. Poggioli

386 LEARNING AND TEACHING OF SECONDARY SCHOOL LATIN

The issues, principles and methods of secondary school teaching of Latin. Supervision and critique of practice teaching.

3 hours, 20 hours laboratory (practice teaching), 9 credits.

Prerequisite: 6 hours Education courses and admission to Teacher Certification Program.

Miss Barton

ENGLISH

JAMES H. BRODERICK, PH.D., *Associate Professor of English and Chairman of the Department*; MARY CURRAN, PH.D., ROBERT HOOPES, PH.D., EMERSON MARKS, PH.D., ALVAN S. RYAN, PH.D., IRVIN STOCK, PH.D., *Professors of English*; MAX BLUESTONE, PH.D., CHARLES A. CAMPBELL, PH.D., EDWIN GITTLEMAN, PH.D., SEYMOUR KATZ, PH.D., CHARLES KNIGHT, PH.D., JOHN MARVIN, M.A., DOROTHY S. MULL, PH.D., ROBERT G. RISSE, PH.D., FREDERICK WILEY, PH.D., *Associate Professors of English*; MARY LEE ALLEN, PH.D., NINA ALONSO, PH.D., DONALD D. BABCOCK, PH.D., ADRIANNE BAYTOP, PH.D., JOEL M. BLAIR, PH.D., MARJORIE COLLINS, PH.D.,

KENNETH C. FREDERICK, PH.D., JAMES LELAND GROVE, PH.D., U. GRANT KEE-
NER, PH.D., DUNCAN NELSON, PH.D.,
SHAUN O'CONNELL, PH.D., RONALD P.
SCHREIBER, PH.D., GEORGE SLOVER,
PH.D. RALPH D. STURM, PH.D., JAMES
G. SWEENEY, PH.D., JOSEPH TRIBBLE,
PH.D., CORNELIA VEENENDAAL, M.A., *As-
sistant Professors of English*; CHARLES
BOWEN, M.A., ALBERT J. DIVVER, M.A.,
MARTHA C. FINNEY, M.A., ROBERTA
HENDRICKSON, M.A., MONICA McALPINE,
M.A., LOUISE MENDILLO, M.A., THEO-
DORE RICHER, M.F.A., LINDA SLOTNICK,
M.A., OTTO VAN OS, M.A., *Instructors in
English*; AYI KWEI ARMAH, M.F.A., CARL
SENNA, *Lecturers in English*; NADYA
AISENBERG, M.A., ANN BERTHOFF, M.A.,
PATRICIA CUMMING, M.A., LINDA HUNT,
M.A., CLIFFORD JOHNSON, B.A., DOR-
OTHY SHUKRI, A.G.S.M., *Part-time Lec-
turers in English*.

GRADUATION REQUIREMENTS

Students majoring in English are expected to choose courses that best satisfy their own interests and needs, and to fulfill, in a sequence of their own devising, a minimum requirement of eight English courses above the sophomore level. In planning their program, English majors must obtain assistance from their departmental advisers; they may also seek assistance from the officers and associates of the four departmental Conferences.

These Conferences bring together students and faculty with common interests to discuss the department's course offerings and other topics of concern to students of English. Students will be helped by the Conference to choose courses that best fulfill their own educational objectives. They will also join with the faculty in suggesting to departmental committees new developments in the program of English courses. In addition, each Conference will sponsor lectures and discussions in the area of its own interests. While participation in a Conference is not required, students are strongly recommended to associate with one or more Conferences.

Conference I: English and American Literature: The Tradition

For students who wish to explore the range and tradition of English and American Literature as they appear in major periods, genres, and writers. Such students should take English 201 and 202 as a preliminary survey of the whole field.

Conference II: Special Topics

For students who wish to explore some special topic within the field of English and American Literature. Such students will be helped to plan programs which combine courses in the field of their special interest with related courses outside it.

Conference III: Creative Writing

For students primarily interested in creative writing. Such students will be helped to plan programs which include, along with creative writing, appropriate courses in literature and criticism. Note that permission of the instructor is required for admission to creative writing courses.

Conference IV: American Literature

For students interested in American Literature and American Studies. The Conference assists students in exploring the following kinds of courses: American Literature in its Cultural Context, American Ethnic and Regional Literature, Form in American Literature, Special Themes in American Literature, and Selected American Authors. The Conference will also offer guidance in the selection of related courses offered by other departments.

ADVANCED PLACEMENT

Students earning a grade of 5 on the Advanced Placement Examination in English are granted 8 credits toward graduation and exemption from English 101-02. Students earning a grade of 3 or 4 may be awarded credit for exemption at the discretion of the department.

COURSE OFFERINGS

010 (I, II) ENGLISH COMPOSITION

Experimental approaches to composition in a limited number of small sections.

3 hours, 3 credits

Staff

100 (I) ENGLISH AS A SECOND LANGUAGE

The mechanics of written English; selected reading; one written theme each week; individual conferences. Open only to students assigned in advance of registration. Course credit only to students who pass the intermediate examination in their own language administered by the Educational Testing Service, or its equivalent as determined by the appropriate department.

3 hours, 4 credits

Mr. Van Os

101 (I), 102 (II) FRESHMAN ENGLISH

A year's practice in writing argument, exposition, and other forms of English prose. Readings and materials are chosen by instructors to focus experience and provoke reflection and debate, as well as to exemplify qualities of writing essential to effective self-expression. A minimum of eight papers the first semester, seven the second.

3 hours, 4 credits

Staff

111 (I, II) GREAT BOOKS AND COMPOSITION

An introduction to 19th-century English, American, and continental literature. Readings from the major writers of the period, such as Wordsworth, Whitman, Dostoevsky, Hawthorne, and Chekhov. Papers required.

3 hours, 4 credits

Prerequisite: English 102

Staff

112 (II) GREAT BOOKS AND COMPOSITION

An introduction to World Literature of the 20th century. Readings from the major writers of the period, such as Yeats, Eliot, Frost, Joyce, Faulkner, Mann, O'Neill, and Brecht. Papers required.

3 hours, 4 credits

Prerequisite: English 111

Staff

201 (I), 202 (II) INTRODUCTION TO ENGLISH LITERATURE

The major periods, genres, and writers of English literature and the relationship between literature and social and intellectual history. The first semester covers the period from the Middle Ages to the 18th century; the second semester from the 18th to the early 20th century, with some attention to American writers. Primarily intended for students planning to major in English.

3 hours, 3 credits

Prerequisite: English 111

Mr. Knight

GROUP I: LITERARY GENRES

211 (I, II) FORMS OF ENGLISH POETRY TO 1700

Individual poems in relation to poems of like kinds. Includes examples of such forms as the ballad, the song, the pastoral, the sonnet, the epic, and narrative verse.
3 hours, 3 credits

Prerequisite: English 111

Mr. Broderick, Miss McAlpine

212 (I, II) FORMS OF ENGLISH AND AMERICAN POETRY SINCE 1700

Individual poems in relation to poems of like kinds. Explores the adaptation of traditional poetic forms to changing thematic and stylistic concerns.
3 hours, 3 credits

Prerequisite: English 111

Mrs. Alonso, Mr. Nelson,
Mrs. Veenendaal, Mr. Willey

215 (I, II) FORMS OF ENGLISH PROSE FICTION

The various kinds of English prose fiction, with some attention to their literary and intellectual milieu.
3 hours, 3 credits

Prerequisite: English 111

Mr. Frederick

216 (I, II) FORMS OF AMERICAN PROSE FICTION

The various kinds of American prose fiction, with some attention to their literary and intellectual milieu.
3 hours, 3 credits

Prerequisite: English 111

Mr. Grove,
Mr. O'Connell, Mr. Tribble

219 (I, II) FORMS OF ENGLISH DRAMA TO 1700

Reading in the English Drama from its beginnings through the Elizabethan Age. Development of such forms as the chronicle play, the miracle play, and the farce.
3 hours, 3 credits

Prerequisite: English 111

Mr. Sweeney, Mr. Slover

220 (I, II) FORMS OF ENGLISH AND AMERICAN DRAMA SINCE 1700

Consideration of drama in English since 1700, with reference to earlier dramatic forms and European works where appropriate. Special attention to the variety of techniques uniquely available to the dramatist.
3 hours, 3 credits

Prerequisite: English 111

Mr. Babcock, Mr. Roberts

304 (II) MEDIEVAL POETRY English poetry from 700 to 1500.

3 hours, 3 credits

Prerequisite: English 111

Miss McAlpine

312 (II) RENAISSANCE POETRY

The poetry of Spenser, Sidney, Shakespeare, Marlowe, and others.

3 hours, 3 credits

Prerequisite: English 111

Mrs. Veenendaal

319 (I) ELIZABETHAN AND STUART DRAMA

The major plays of the period. The relationships between dramatic form and theatre conventions and conditions. Special attention to Marlowe, Jonson, Webster, Middleton, and Ford.

3 hours, 3 credits

Prerequisite: English 111

Mr. Sweeney

322 (I) ENGLISH POETRY OF THE EARLY SEVENTEENTH CENTURY

Divergent traditions in 17th century poetry, with emphasis on the "schools" of Donne and Jonson. Poets include Donne, Herbert, Vaughan, Marvell, Jonson, Herrick, Waller and Carew.

3 hours, 3 credits

Prerequisite: English 111

Mr. Chernaik,

Mr. Divver

325 (II) SEVENTEENTH-CENTURY PROSE

The development of 17th-century prose in light of intellectual and aesthetic preoccupations of the period. Authors include Bacon, Donne, Browne, Hobbes, Milton and Dryden.
3 hours, 3 credits

Prerequisite: English 111

Staff

337 (II) EIGHTEENTH-CENTURY FICTION

The historical emergence of the novel and aesthetic characteristics of the form in the works of such early masters as Richardson, Fielding, Smollett, Sterne and Austen.

3 hours, 3 credits

Prerequisite: English 111

Mr. Knight

342 (II) VICTORIAN POETRY

Selected works by Tennyson, Browning, Arnold, Hopkins, and Hardy.

3 hours, 3 credits

Prerequisite: English 111

Mr. Broderick,

Mr. Ryan

347 (II) NINETEENTH-CENTURY ENGLISH PROSE FICTION

Major English novelists of the 19th century, including the Brontës, George Eliot, Dickens, Thackeray, Meredith, and Hardy.

3 hours, 3 credits

Prerequisite: English 111

Mr. Willey

350 (I) AUTOBIOGRAPHY IN AMERICA

The major autobiographical works, from colonial to modern times, by such writers as Edwards, Franklin, Thoreau, James, Adams, Fitzgerald, Malcolm X, and Mailer.

3 hours, 3 credits

Prerequisite: English 111 Mr. Van Os

352 (II) MODERN AMERICAN POETRY

Major trends and figures in 20th-century American poetry, from the Imagist movement and the founding of *Poetry* in 1912 to the present. Emphasis on Frost, Eliot, Pound, Williams, Stevens, Cummings, Lowell, Roethke, Wilbur and Dickey.

3 hours, 3 credits

Prerequisite: English 111 Staff

357 (II) MODERN AMERICAN FICTION

Major American novelists from about 1890 to the present. The art of Crane, Dreiser, Wharton, Dos Passos, Hemingway, Fitzgerald, Faulkner, and West, including recurrent social and cultural themes in their works.

3 hours, 3 credits

Prerequisite: English 111 Mr. Grove,
Mr. Sturm, Mr. Willey

359 (II) MODERN DRAMA

Development of naturalism, impressionism, and the tradition of the New Theatre in 19th- and 20th-century drama. Continental, English, and American plays.

3 hours, 3 credits

Prerequisite: English 111 Mr. Babcock,
Mr. Roberts

360 (I) MID-TWENTIETH CENTURY DRAMA

The ideas, values, and techniques of the contemporary theatre.

3 hours, 3 credits

Prerequisite: English 111 Mr. Babcock,
Mr. Roberts

362 (I) POST WORLD WAR II COMIC FICTION

The art and the vision of contemporary life of such post-war comic novelists as Bellow, Roth, Donleavy, and Nabokov.

3 hours, 3 credits

Prerequisite: English 111 Miss Allen,
Mr. Keener

372 (II) SATIRE

The problems involved in defining satire from social, philosophical, and formalist points of view. Reading and discussion of a number of satiric works from a variety of genres and periods, ranging from classical times to the present.

3 hours, 3 credits

Prerequisite: English 111 Mr. Knight

GROUP II: LITERATURE IN ITS CULTURAL CONTEXT

275 (I, II) THE MEDIEVAL PERIOD

The concerns and techniques of Old and Middle English writers including the *Beowulf* and *Gawain* poets, the Wakefield dramatist, Gower, Langland, Chaucer, and Malory.

3 hours, 3 credits

Prerequisite: English 111 Mrs. Collins

277 (I, II) THE RENAISSANCE

The predominant currents of thought in the Renaissance, and of the works of such writers as More, Lyly, Marlowe, Jonson, Sidney, Wyatt, Surrey, and Shakespeare. Supplementary readings from Renaissance criticism.

3 hours, 3 credits

Prerequisite: English 111 Mrs. Mull

281 (I, II) THE NEO-CLASSICAL PERIOD

The chief intellectual and social currents of the Restoration and 18th century, and of the works of such writers as Dryden, Swift, Pope, Defoe, Fielding, Johnson, and Burke.

3 hours, 3 credits

Prerequisite: English 111 Mr. Blair,
Mr. Marks

283 (I, II) THE ROMANTIC PERIOD

The literature and leading ideas of English Romanticism, with special emphasis on the poetry and prose of Blake, Wordsworth, Coleridge, Byron, Keats, and Shelley.

3 hours, 3 credits

Prerequisite: English 111 Mr. Ryan,
Mr. Stock, Mr. Vitoux

285 (I, II) THE VICTORIAN AGE

Readings in Carlyle, Tennyson, Dickens, Browning, Newman, Arnold, Hopkins, and Pater, whose work will be studied in the context of the literary, intellectual, and social history of the Victorian Age.

3 hours, 3 credits

Prerequisite: English 111 Mr. Broderick,
Mr. Ryan

287 (I, II) AMERICAN ROMANTICISM

The growing importance of symbol and ideal in the period from 1836 to 1855. Emphasis on romantic imagination in Poe, Emerson, Thoreau, Hawthorne, and Melville, with readings in the Cambridge school and the minor Transcendentalists.

3 hours, 3 credits

Prerequisite: English III Mr. Gittleman,
Mr. Van Os

289 (I, II) THE RISE OF AMERICAN REALISM

The emergence of the realistic temper in the poetry of Whitman and its development through Twain, James, and Howells into the naturalism of Norris, Crane, and Dreiser.

3 hours, 3 credits

Prerequisite: English III Mr. Katz,
Mr. Tribble

291 (I, II) THE MODERN PERIOD

Readings in such writers as Eliot, Hemingway, Lawrence, Joyce, Faulkner, Auden, Thomas, and Lowell.

3 hours, 3 credits

Prerequisite: English III Miss Allen,
Mrs. Curran, Mr. Keener

GROUP III: REGIONAL AND ETHNIC LITERATURE

303 (I) EARLY CELTIC LITERATURE IN TRANSLATION

The mythological, heroic, and lyric literature of Ireland and Wales in its cultural context, from the earliest written sources through the later Middle Ages.

3 hours, 3 credits

Prerequisite: English III Mr. Bowen

358 (II) BLACK LITERATURE IN AMERICA

Examination of the historical and social context from which American Negro writing emerged, and of works by such authors as Johnson, Hughes, Wright, Ellison, Baldwin, Brooks, Tolson, and Jones.

3 hours, 3 credits

Prerequisite: English III Mr. Johnson,
Mr. Senna

361 (I) IRISH LITERATURE

Leading figures of the Irish Renaissance, with special emphasis on Joyce, Yeats, Synge, and O'Casey.

3 hours, 3 credits

Prerequisite: English III Mrs. Curran

HUMANITIES 249 (I, II) AFRICAN LITERATURE

Includes such writers as Yacine, Bourboune, Ouologuem, Soyinka, Ngugi, p'Bitek, Paton, and Abrahams.

3 hours, 3 credits

Prerequisite: English III Mr. Armah,
Mr. Senna

GROUP IV: MAJOR AUTHORS

305 (I) CHAUCER

The Canterbury Tales and selected minor works.

3 hours, 3 credits

Prerequisite: English III Mr. Risse

313 (I) SHAKESPEARE'S PLAYS:

A SURVEY

The comedies, early histories, and early tragedies of Shakespeare.

3 hours, 3 credits

Prerequisite: English III Miss Baytop,
Mr. Bluestone, Mr. Slover

314 (II) SHAKESPEARE'S PLAYS:

A SURVEY

Continuation of English 313: the later histories, problem plays, major tragedies, and late romances.

3 hours, 3 credits

Prerequisite: English III Miss Baytop,
Mr. Bluestone, Mr. Slover

326 (II) MILTON

The major poetry and prose of John Milton.

3 hours, 3 credits

Prerequisite: English III Mr. Hoopes

339 (I) BLAKE

Readings in lyrics and prophecies of William Blake.

3 hours, 3 credits

Prerequisite: English III Mr. Schreiber

363 (II) YEATS

Yeats' development as a poet, from his early Pre-Raphaelite poetry through his late-modern poems, within the framework of Irish history and literature.

3 hours, 3 credits

Prerequisite: English III Mrs. Curran

365 (I) FAULKNER

Faulkner's fiction studied as a major saga of modern man.

3 hours, 3 credits

Prerequisite: English III Mr. Marvin,
Mr. Tribble

GROUP V: LANGUAGE, LITERARY CRITICISM, AND OTHER TOPICS

374 (II) PRINCIPLES AND METHODS OF LITERARY CRITICISM

Principal methods of literary criticism (formalistic, historical, sociological, archetypal, mythic, and psychological) in relation to several works of literature.

3 hours, 3 credits

Prerequisite: English 111 Mr. Sturm

375 (I) HISTORY OF THE ENGLISH LANGUAGE

Development of the English language from its beginnings to the present; selected passages of British and American writing and speech; concepts and techniques of descriptive linguistics.

3 hours, 3 credits

Prerequisite: English 111 or permission of instructor Mrs. Collins, Mrs. Mull

376 (II) HISTORY OF PROSE STYLE

Characteristics of literary and oral English prose styles from Middle English to the present.

3 hours, 3 credits

Prerequisite: English 111 Staff

381 (I), 382 (II) SELECTED TOPICS IN ENGLISH AND AMERICAN LITERATURE

Intensive study of topics in literature. Course content will vary each semester and will be announced during pre-registration periods.

3 hours, 3 credits

Prerequisite: English 111 Staff

HUMANITIES 243 (I) MYTHOLOGY AND LITERATURE

Classical, Celtic, and other myths, and their persistence and transformation in English and American literature.

3 hours, 3 credits

Prerequisite: English 111 Mrs. Mendillo

GROUP VI: WRITING

250 (I), 251 (II) CREATIVE WRITING

Techniques and forms of fiction and poetry. Classroom discussion of student manuscripts and frequent conferences.

3 hours, 3 credits

Prerequisite: permission of instructor

Mr. Marvin, Mr. Richer, Mrs. Veenendaal

252 (I) ADVANCED COMPOSITION

Techniques of effective expository writing.

3 hours, 3 credits

Prerequisite: English 111 Mr. O'Connell

253 (I), 254 (II) CREATIVE WRITING WORKSHOP

The structuring of chapters of a short novel, the thematic relationships in a series of stories or poems, and development of style and point of view.

3 hours, 3 credits

Prerequisite: Senior standing and permission of instructor Mr. Marvin

GROUP VII: SPECIALLY DIRECTED STUDY

ENGLISH COURSE FOR TEACHER CERTIFICATION:

386 (I, II) TEACHING OF SECONDARY SCHOOL ENGLISH

The issues and principles of the learning and teaching of secondary school composition, literature, and language. Supervision and critique of practice teaching in the schools. 3 hours, 20 hours laboratory (practice teaching), 9 credits (6 towards major)

Prerequisite: 6 hours Education courses

Mr. Campbell

390 (I), 391 (II) SENIOR SEMINARS

In-depth study of special topics in British and American literature. Course content will vary each semester and will be announced during pre-registration periods. Classes limited to 15 students.

3 hours, 3 credits

Prerequisite: Senior standing and permission of instructor Staff

397 (I, II) INDEPENDENT STUDY

Open only to a very limited number of students in any one semester. A written prospectus of the project is required of applicants.

3 hours, 3 credits

Prerequisite: permission of instructor and department chairman Staff

398 (I) HONORS WORK I

A student-initiated program of study planned with an honors adviser who will provide counsel and direction as needed and desired. Either a special project or wide reading in English and American literature designed to acquaint the student with areas not adequately covered by his courses or by independent work. Requires a final oral examination administered by members of the Honors Board, presided over by the adviser.

3 hours, 3 credits

Prerequisite: Senior standing, 3.0 overall and major average, and permission of Honors Committee Staff

Study in depth of a topic chosen by the student, and a paper written with the approval and under the direction of an honors adviser, normally arising from reading done in Honors Work I. Departmental Honors will be awarded on the basis of the Honors Work I oral examination and the evaluation of the paper by the Honors Board.

3 hours, 3 credits

Prerequisite: English 398 and permission of Honors Committee Staff

FRENCH

JOHN MACCOMBIE, PH.D., *Associate Professor of French and Chairman of the Department*; JEAN COLLIGNON, *Agrégé d'anglais, Professor of French*; FREDERICK BUSI, PH.D., MICHEL PHILIP, *Agrégé des lettres*, ALFRED PROULX, PH.D., *Associate Professors of French*; ROSE ABENDSTERN, PH.D., MARY LEE EVANS KIMBALL, D.E.U., BETTY MCILVAIN, PH.D., GEORGES-MICHEL SAROTTE, *Agrégé d'anglais, Assistant Professors of French*; GERALD C. VOLPE, PH.D., *Assistant Professor of French and Italian*; JEANNE GRILLET, D.E.S. d'anglais, MARILYN SORENSON, M.A., MONIQUE STERN, M.A., CHRISTIAN TACONET, M.A., BRIAN THOMPSON, M.A., LILIAN WILLEMS, M.A., *Instructors in French*; DAVID BUSKEY, B.A., *Lecturer in French*.

GRADUATION REQUIREMENTS

French majors must take a minimum of 30 credits in Junior-Senior level courses in French. All majors are required to take French 241-42 or its equivalent, and are urged to elect it in the Sophomore year.

It is strongly recommended that majors elect two years of course work in a second foreign language.

Honors Thesis: a student may receive 6 credits toward his total 30 major credits for acceptable work on an Honors Thesis written in French under the direction of an adviser from the French faculty.

At the end of the Senior year, majors may take a comprehensive exam in French, covering three specific fields of French literature (the fields to be chosen at the option of the student), but will be

expected to have some knowledge of the course and direction of French literature in general. At the beginning of the Junior year, a reading list will be supplied to the student as a guide for the exam. The exam will total 1 hour oral and 4 hours written. Students should consult the department.

It is recommended that students take the ETS (Educational Testing Service) Language proficiency exams in the spring of their Senior year.

COURSE OFFERINGS

111 (I), 112 (II) ELEMENTARY FRENCH

Intensive practice in the four language skills, with an audio-lingual approach, for students who have no creditable training in French. 5 hours, 2 hours laboratory 4 credits each semester

Miss Grillet and Staff

115 (I) BASIC ORAL FRENCH

Extensive oral practice and drill of basic linguistic patterns in French for students who need them to qualify for Intermediate French.

5 hours, 2 hours laboratory, 4 credits

Prerequisite: background in the language and placement exam Mr. Thompson and Staff

121 (I, II), 122 (I, II) INTERMEDIATE FRENCH

An intensive review and further study of grammar and audio-lingual skills with correlated intermediate-level readings in French literature.

4 hours, 2 hours laboratory, 4 credits each semester

Prerequisite: French 112 or equivalent

Mrs. McIlvain and Staff

125 (I) 126 (II) INTENSIVE FRENCH

Intensive work in the four language skills with concentration on an audio-lingual approach and an introduction to literature, for students with no creditable previous training in French who intend to continue their study of French language and literature at an advanced level. Students completing this course satisfactorily will be allowed to enter directly into courses at the 200 level and above.

9 hours, 3 laboratory periods, 8 credits each semester

Prerequisite: minimum score of 600 on the SAT verbal or high upper-class course average; departmental permission

Miss Sorenson and Staff

231 (I, II) SURVEY OF FRENCH LITERATURE

French literature and culture from the 11th century through the mid-18th century.

3 hours, 3 credits

Prerequisite: French 122 or equivalent
Miss Abendstern and Staff

232 (I, II) SURVEY OF FRENCH LITERATURE

French literature and culture from the mid-18th century through the mid-20th century.

3 hours, 3 credits

Prerequisite: French 122 or equivalent
Miss Abendstern and Staff

235 (I, II) FRENCH WRITERS AS WITNESSES OF THEIR TIMES

Treatment of one main theme (such as the education of women and their role in society; the attitude of youth towards society and of society towards youth; moral sincerity; the discovery of self) to be developed through a study of works from different periods of French literature. The theme will vary each semester and will be announced in advance.

3 hours, 3 credits

Prerequisite: French 122 or equivalent
Mr. Philip

241 (I, II) TRADUCTION ET STYLISTIQUE

An intensive study of grammar, stylistics and composition; problems of idiomatic translation based on contemporary English and American texts.

3 hours, 2 hours laboratory, 3 credits

Prerequisite: French 122 or equivalent, or permission of instructor

Mr. Sarotte and Staff

242 (I, II) EXPLICATION DE TEXTE

An intensive study of methods of literary analysis, based on texts selected from various periods of French literature.

3 hours, 2 hours laboratory, 3 credits

Prerequisite: French 241 or equivalent, or permission of instructor

Mr. Sarotte and Staff

261 (II) MODERN FRENCH NOVEL IN TRANSLATION: 1900-1935

Works by Proust, Cocteau, Gide, Saint-Exupéry and Malraux.

3 hours, 3 credits

Prerequisite: English 111 or permission of instructor
Mr. Proulx

262 (II) MODERN FRENCH NOVEL IN TRANSLATION: 1935 UNTIL THE PRESENT

Works by Sartre, Camus, Mauriac, Robbe-Grillet and Genet.

3 hours, 3 credits

Prerequisite: English 111 or permission of instructor
Mr. Proulx

263 (I) THE BLACK SOUL AND THE THEATRE

A comparative approach to the image of the Black man in contemporary theatre. An analytical and comparative study of various French and American plays by white and black French-speaking writers and also of American plays by white and black American writers, all of them dealing with the experience of the Black man.

3 hours, 3 credits

Prerequisite: English 111 and reading knowledge of French (some of the French plays not being available in English translation)

Mr. Sarotte

300 (I) HISTOIRE DE LA LANGUE FRANÇAISE

Survey of the evolution of French from spoken Latin to the modern language with analysis of texts from each major period.

3 hours, 3 credits

Prerequisite: French 232 or 241 or equivalent, or permission of instructor
Miss Grillet

301 (II) LA LITTÉRATURE FRANÇAISE AU MOYEN AGE

Survey of French literature from the 11th century to the 15th, according to genres. All texts (including the *Chanson de Roland*, *Lancelot*, *Tristan et Iseut*, *Roman de Renard*, and lyric poetry) adapted into modern French.

3 hours, 3 credits

Prerequisite: French 232 or 242, or permission of instructor
Mr. Volpe

311 (I) LA RENAISSANCE FRANÇAISE: L'ÂGE DE RABELAIS

Chronological survey of French literature in the 16th century, with particular emphasis on continuity with the Middle Ages, consciousness of the New Age, and Italian influence. Readings from Marot, Rabelais, Calvin, Scève, Labé, Marghélite, d'Angoulême, Du Bellay, Ronsard until 1660.

3 hours, 3 credits

Prerequisite: French 232 or 242, or permission of instructor
Mrs. McIlvain

312 (II) LA RENAISSANCE

FRANÇAISE: L'ÂGE DE MONTAIGNE

Readings from Ronsard after 1660, Larivey, Garnier, Montaigne, Sponde, D'Aubigné.
3 hours, 3 credits

Prerequisite: French 232 or 242, or permission of instructor Mr. Volpe

321 (I) LA LITTÉRATURE DU 17^E SIÈCLE: THÉÂTRE ET PHILOSOPHES

Works from 17th century authors including Descartes, Corneille, Racine, Molière, and Pascal.

3 hours, 3 credits

Prerequisite: French 232 or 242, or permission of instructor Mr. Philip

322 (II) LA LITTÉRATURE DU 17^E SIÈCLE: PROSE ET POÉSIE

Works by Bossuet, Boileau, La Fontaine, Madame de La Fayette, La Rochefoucauld, Madame de Sevigné, La Bruyère.

3 hours, 3 credits

Prerequisite: French 232 or 242, or permission of instructor Mr. Philip

331 (II) THÉÂTRE ET ROMAN DU 18^E SIÈCLE

Plays by Marivaux and Beaumarchais, and novels by Voltaire, Diderot, J. J. Rousseau, Laclos.

3 hours, 3 credits

Prerequisite: French 232 or 242, or permission of instructor Mr. Collignon

332 (I) LA PENSÉE PHILOSOPHIQUE DU 18^E SIÈCLE

Philosophical texts by Montesquieu, La Mettrie, Voltaire, Rousseau, Condillac; *l'Encyclopédie*.

3 hours, 3 credits

Prerequisite: French 232 or 242, or permission of instructor Mr. Collignon

341 (I) LE ROMANTISME FRANÇAIS: PRÉROMANTISME ET POÉSIE ROMANTIQUE

Chateaubriand and Romantic poets including Lamartine, Hugo, Vigny, Musset, Nerval.

3 hours, 3 credits

Prerequisite: French 232 or 242, or permission of instructor Miss Abendstern

342 (II) LE ROMANTISME FRANÇAIS: THÉÂTRE ET ROMAN ROMANTIQUES

The French Romantic theatre and novel through reading and discussion of works by

Hugo, Vigny, Musset, Sand, Balzac, Stendhal.
3 hours, 3 credits

Prerequisite: French 232 or 242, or permission of instructor Miss Abendstern

345 (I) LA POÉSIE SYMBOLISTE

Works selected from the poetry of Baudelaire, Verlaine, Rimbaud, and Mallarmé.

3 hours, 3 credits

Prerequisite: French 232 or 242, or permission of instructor Mr. MacCombie

346 (II) LA POÉSIE CONTEMPORAINE

Works by Claudel, Apollinaire, Aragon, René Char, Frances Ponge, Valéry, St. Jean de Perse.

348 (I) LE ROMAN FRANÇAIS: 1850-1900

Novels by Flaubert, Fromentin, Les Goncourt, Maupassant, Zola, Huysmans.

3 hours, 3 credits

Prerequisite: French 232 or 242, or permission of instructor Mr. Busi

351 (I) LE THÉÂTRE FRANÇAIS AU 20^E SIÈCLE

Plays by Jarry, Claudel, Giraudoux, Sartre, Camus, Ionesco, Genet.

3 hours, 3 credits

Prerequisite: French 232 or 242, or permission of instructor Mr. Collignon

353 (I) LE ROMAN MODERNE: 1900-1935

Works by Proust, Fournier, Radiguet, Cocteau, Colette, Gide, Mauriac, Green and Saint-Exupéry.

3 hours, 3 credits

Prerequisite: French 232 or 242, or permission of instructor Staff

354 (II) LE ROMAN MODERNE: 1935 JUSQU'AU PRÉSENT

Works by Céline, Sartre, Camus, de Beauvoir, Mauriac, Robbe-Grillet, Genet, and Pinget.

3 hours, 3 credits

Prerequisite: French 232 or 242, or permission of instructor Staff

358 (II) LA PROSE ET LA POÉSIE NOIRES D'EXPRESSION FRANÇAISE

Selected prose and poetry of representative Black authors in French-speaking countries, focusing on the works of Senghor, Césaire, Damas, Camara, and Laye.

3 hours, 3 credits

Prerequisite: French 231 or 241, or permission of instructor Mr. Sarotte

**362 (II) L'ÉDUCATION VUE PAR
LES ÉCRIVAINS FRANÇAIS**

Readings and discussion of French texts relative to pedagogic and educational theory from authors including LaSalle, Montaigne, Rabelais, and Rousseau.

3 hours, 3 credits

Prerequisite: French 232 or 242, or permission of instructor
Mr. Volpe

**365 (I) LA CIVILISATION
FRANÇAISE**

The background of contemporary France; today's France; historical, political, social, economic, cultural.

3 hours, 3 credits

Prerequisite: French 231 or 241 or equivalent
Staff

**371 (I) SÉMINAIRE: LA
LITTÉRATURE FANTASTIQUE AU
19^E SIÈCLE**

Works by Nodier, Balzac, Launtraumont, Barbey d'Aurevilly, Villiers de l'Isle-Adam.

3 hours, 3 credits

Prerequisite: permission of instructor
Mr. Philip

**372 (II) SÉMINAIRE: LES
AVANTS-GARDES AU 20^E SIÈCLE**

Works by Proust, Roussel, Breton, Artaud, Beckett, Ponge, Blanchot.

3 hours, 3 credits

Prerequisite: permission of instructor
Mr. Collignon

**373 (I) SÉMINAIRE:
L'EXISTENTIALISME**

Readings and discussion of works by Gide, Malraux, Camus, Sartre, de Beauvoir, Beckett, and Céline as they reveal existentialist concepts and their development.

3 hours, 3 credits

Prerequisite: French 231 or 241, or permission of instructor
Mr. Proulx

**374 (II) SÉMINAIRE: LA
LITTÉRATURE FRANÇAISE DANS LA
TRADITION CATHOLIQUE: 1880-1930**

The novel, theater, and poetry of Bourget, Barrès, Péguy, Claudel, Martin du Gard, Bernanos, and Mauriac with emphasis on the manner in which Catholic religious beliefs—generally considered essential to the literary formation of these authors—are reflected and differentiated in the development of their works.

3 hours, 3 credits

Prerequisite: French 232 or 242, or permission of instructor
Mr. Busi

**376 (II) SÉMINAIRE: LE GENRE
ROMANESQUE EN FRANCE DU
17^E SIÈCLE À NOS JOURS**

The novel as a genre, starting with one of the first masterworks, *La Princesse de Clèves*, and undertaking to show, through different stages of the development of the genre, how it evolved through the centuries to its present form.

3 hours, 3 credits

Prerequisite: permission of instructor
Mr. Philip

**377 (I) SÉMINAIRE: RÉVOLTÉS,
VISIONNAIRES ET DE DÉCADENTS**

Poets and prose writers somewhat removed from the main literary currents of the late 19th century by their originality or even eccentricity. Writers such as Rimbaud, Launtraumont, Laforgue, Villiers de l'Isle-Adam and others who revolted against their times and their society.

3 hours, 3 credits

Prerequisite: French 231 or 241 and permission of instructor
Mr. Philip

**379 (I) SÉMINAIRE: L'ART D'ÉCRIRE:
THÉORIE ET PRATIQUE**

A creative writing seminar in French: poems, plays, short stories, essays. Professional criticism and discussion.

3 hours, 3 credits

Prerequisite: permission of instructor
Staff

**386 (I, II) TEACHING OF FRENCH
IN THE SECONDARY SCHOOL**

The issues, principles and methods of secondary school French language teaching. Supervision and critique of practice teaching.

3 hours, 20 hours laboratory, 9 credits

Prerequisite: 6 hours Education courses
N.B. This course does not fulfill French major requirements.
Miss Willens

**398 (I), 399 (II) HONORS THESIS IN
FRENCH**

Independent and original investigation and study under the supervision of a faculty adviser. An oral defense of the thesis before members of the French department is required.

3 credits each semester

Prerequisite: departmental permission
Staff

GERMAN

ALFRED HOELZEL, PH.D., Associate Professor of German and Chairman of the Department; ANDREW BOELCSKEVY, PH.D.,

LUISE BRONNER, PH.D., LYNN F. DHORITY, PH.D., DAVID H. MILES, PH.D., FREDERICK P. OTT, PH.D., SANDRA SHUMAN, PH.D., *Assistant Professors of German.*

GRADUATION REQUIREMENTS

German majors must take a minimum of 24 credits in Junior-Senior level courses, including German 221-222. A course in History of Germany, given by the History Department, is also required. Second semester Seniors will take the ETS Undergraduate Record Examination in German.

Note: The German Department strongly encourages all majors in German to achieve a solid background in a second field, preferably in an area within the Humanities, or in European History, or in Politics. The extent to which this is possible will be directly related to the amount of creditable prior training in German which a student offers upon entrance to the Department.

COURSE OFFERINGS

111 (I) , 112 (II) ELEMENTARY GERMAN

For students with no creditable training in German. Intensive practice in the four language skills, with an audio-lingual approach, 4 hours; 2 hours laboratory
4 credits each semester

Staff

121 (I), 122 (II) INTERMEDIATE GERMAN

Intensive review of grammar and further development of all four language skills.
4 hours, 4 credits each semester

Prerequisite: German 112 or equivalent

Staff

221 (I), 222 (II) ADVANCED GERMAN COMPOSITION AND CONVERSATION

Grammar and stylistics. Oral and written essays.

3 hours, 3 credits each semester

Prerequisite: German 122

Staff

231 (I, II) INTRODUCTION TO GERMAN LITERATURE

Reading of representative masterpieces of German prose, drama and poetry from the Enlightenment to the present day. Works will be discussed in cultural and historical context. Short papers required.

3 hours, 3 credits

Prerequisite: German 122 or equivalent

Staff

241 (I), 242 (II) INTRODUCTION TO GERMAN CIVILIZATION

Readings in German history, politics, philosophy, science, literature and art. Recommended for students who need a fifth-semester course to fulfill language core requirements.

3 hours, 3 credits

Prerequisite: German 122

Staff

Not offered 1970-71

251 (I) MODERN GERMAN LITERATURE IN TRANSLATION

Selected masterpieces of modern German literature, including Mann, Hesse, Kafka and Brecht. German majors may not take this course for credit.

3 hours, 3 credits

Prerequisite: English 111

Staff

Not offered 1970-71

301 (I), 302 (II) AGE OF GOETHE

German literature covering the period from 1750 to 1830, from Enlightenment through Romanticism.

3 hours, 3 credits

Prerequisite: German 232

Mr. Dhority

331 (I) GERMAN LITERATURE FROM NATURALISM TO EXPRESSIONISM

German literature in the late 19th and early 20th Centuries.

3 hours, 3 credits

Prerequisite: German 231

Miss Shuman

332 (II) GERMAN LITERATURE FROM THE END OF WORLD WAR I TO PRESENT

German literature in the Weimar Republic: Mann, Hesse, Kafka, Brecht, Duerrenmatt and Grass.

3 hours, 3 credits

Prerequisite: German 231

Mr. Dhority

334 (II) GERMAN POST WAR PROSE FROM EAST TO WEST

Works by Böll, Grass, Johnson, Bienek, Lind and Wolf.

3 hours, 3 credits

Prerequisite: German 231

Mr. Ott

341 (I) GERMAN DRAMA FROM LESSING TO THE PRESENT

Selected major German dramas beginning with Lessing's *Minna von Barnhelm* and ending with *Soldaten* by the contemporary writer Rolf Hochhuth. Discussions from the viewpoint of theatre as well as literature.

3 hours, 3 credits

Prerequisite: German 231

Mr. Hoelzel

342 (II) THE GERMAN NOVELLE

The development of the Novelle in 19th century German letters.

3 hours, 3 credits

Prerequisite: German 231 Miss Bronner

362 (I, II) HISTORY OF THE GERMAN LANGUAGE

The development of the German language.

3 hours, 3 credits

Not offered 1970-71 Staff

364 (II) READINGS IN MIDDLE HIGH GERMAN PROSE AND POETRY

An introduction to the language and literature of medieval Germany.

3 hours, 3 credits

Prerequisite: German 231 Staff
Not offered 1970-71

386 (II) LEARNING AND TEACHING OF SECONDARY SCHOOL GERMAN

The issues and principles of the learning and teaching of secondary school German language and culture. Supervision and critique of practice teaching in the schools.

3 hours, 20 hours laboratory (practice teaching), 9 credits

Prerequisite: 6 hours Education courses
Mr. Hoelzel

396 (II) SENIOR HONORS SEMINAR IN GERMAN

A critical investigation of literary themes or genres or of one major literary figure. The writing and defense of a research paper required. Required of all Seniors wishing to graduate with honors in German.

Seminar, 3 credits

Prerequisite: Senior standing; German major and/or permission of the department Staff

ITALIAN

GERALD VOLPE, PH.D., *Assistant Professor of French and Italian and Acting Chairman of the Department*; ANTONIO F. CARRARA, M.A., ADOLPH CASO, M.A., ELEANOR PERKINS, M.A., *Instructors in Italian*.

GRADUATION REQUIREMENTS

Majors are required to take a minimum of 30 credits in Junior-Senior level courses in

Italian, including Italian 241-42 (or its equivalent). All majors must have taken Italian 231 (or its equivalent) as prerequisite for advanced literature courses.

At the end of the Senior year, majors are encouraged to take a comprehensive oral and written examination in Italian, both as an academic experience summing up their Italian studies and as qualification for the University and Departmental awards in Italian. The examination would cover three specific fields of Italian literature (to be chosen by the student from among: 1. Il Duecento e Il Trecento; 2. Umanesimo e Rinascimento; 3. Il Seicento e il Settecento; 4. Romanticismo e Risorgimento; 5. Il Novecento) but the student would be expected to have some knowledge of the course and direction of Italian literature in general. Students who wish to take the examination should consult the academic adviser at the beginning of the Spring semester of the Senior year.

Departmental Honors. To graduate with honors, a student must: 1. achieve a 3.5 grade average in his Italian studies; 2. submit to the Italian Department a short research paper written during the second semester of his Senior year under the supervision of a Departmental adviser; 3. take the comprehensive examination; 4. be recommended by the Departmental Honors committee; 5. attain a 3.0 overall grade average.

The student may elect to discuss his Honors paper in an open Departmental meeting instead of taking the oral part of the comprehensive examination.

The Department grants 6 credits towards the total 30 major credits for successful completion of the Honors program.

COURSE OFFERINGS

111 (I) , 112 (II) ELEMENTARY ITALIAN

For students who have no creditable training in Italian, intensive practice in the four language skills, with an audio-lingual approach.

4 hours, 2 hours laboratory

4 credits each semester

Mrs. Perkins and Staff

121 (I), 122 (II) INTERMEDIATE
ITALIAN

An intensive review of grammar and further study of audio-lingual skills with correlated readings in Italian literature.

4 hours, 2 hours laboratory

4 credits each semester

Prerequisite: Italian 112 or equivalent

Mr. Caso and Staff

231 (I), 232 (II) INTRODUCTION TO
ITALIAN CULTURE THROUGH
LITERATURE

A survey of Italian literature as a reflection of the civilization from the Renaissance to the modern period.

3 hours, 3 credits each semester

Prerequisite: Italian 122 or equivalent

Mr. Carrara and Staff

241 (I), 242 (II) COMPOSITION AND
STYLISTICS

The development of individual style through analysis of contemporary texts and intensive exercises in free composition.

3 hours, 3 credits

Prerequisite: Italian 122 or equivalent and permission of instructor

Mr. Caso

301 (I), 302 (II) DANTE AND THE
DUECENTO

Selections from the minor works of Dante and from his contemporaries as an introduction to the study of the *Commedia*. The first semester will be devoted to the "stil novo", the *Vita Nuova*, and the *Inferno*; the second to the *Purgatorio* and the *Paradiso*.

3 hours, 3 credits each semester

Prerequisite: Italian 231 or equivalent and permission of instructor

Mr. Volpe

305 (I) PETRARCA AND BOCCACCIO

An analysis and discussion of the works of these two masters as they reflect the Humanist rejection of medieval mysticism and preoccupation with man's earthly condition.

3 hours, 3 credits

Prerequisite: Italian 231 or equivalent and permission of instructor

Mr. Carrara

311 (I) THE AGE OF HUMANISM IN
ITALY

The Humanist literature of the Italian Renaissance in the light of the intellectual and artistic preoccupations of the Age.

3 hours, 3 credits

Prerequisite: Italian 231 or equivalent and permission of instructor

Mr. Caso

312 (II) THE ITALIAN RENAISSANCE
Machiavelli, Castiglione, Ariosto, and Tasso as exponents of the multiple aspirations and achievements of Italy's Golden Age.

3 hours, 3 credits

Prerequisite: Italian 231 or equivalent and permission of instructor

Mr. Carrara

331 (II) ITALIAN LITERATURE OF
THE 17TH AND 18TH CENTURIES

Marino, Vico, Goldoni, Parini, and Alfieri as examples of the development from the extravagance of the Baroque to the rationalism of the Age of Enlightenment.

3 hours, 3 credits

Prerequisite: Italian 231 or equivalent and permission of instructor

Staff

341 (I) NEO-CLASSICISM AND
ROMANTICISM

An analysis of this complex movement in its exaltation of liberty and imagination during the revolutionary period of the Risorgimento when Italy became a nation. Monti, Foscoli, Leopardi, and Manzoni.

3 hours, 3 credits

Prerequisite: Italian 231 or equivalent and permission of instructor

Staff

351 (I) THE MODERN ITALIAN
NOVEL

An analysis of the post-romantic literary trends such as "verismo", "regionalismo", and "neo-realismo". Some of the authors to be studied are Verga, Svevo, Pirandello, and Silone.

3 hours, 3 credits

Prerequisite: Italian 231 or equivalent and permission of instructor

Staff

352 (II) THE CONTEMPORARY
ITALIAN NOVEL

Such trends as "Letterature di costume", "Il romanzo psicologico", and "I Mimetici" and the avant-garde movements considered in the writings of Levi, Vittorini, Moravia, Pasolini, and others.

3 hours, 3 credits

Prerequisite: Italian 231 or equivalent and permission of instructor

Staff

361 (I) MODERN ITALIAN POETRY

A survey of the principal poets from Carducci to Saba, with emphasis on hermeticism.

3 hours, 3 credits

Prerequisite: Italian 231 or equivalent and permission of instructor

Staff

MUSIC

NICHOLAS TAWA, M.A., *Associate Professor of Music and Acting Chairman of the Department*; ROBERT PRINS, M.M., JOHN HUGGLER, B.M., *Associate Professors of Music*; A. LEON WHEELER, *Lecturer in Music*.

GRADUATION REQUIREMENTS

Music majors must take a minimum of 34 credits in music which must include Music 121-22, 221-22, and 300. All music majors will also be expected to take at least two courses in music history and literature.

It is recommended that all music majors acquire at least an elementary proficiency at the piano. A minimum of three years membership in a performing group is also urged.

Each student majoring in music will be assisted by a departmental adviser to plan a sequence of courses that will suit his own needs and satisfy the requirements of the Music Department.

COURSE OFFERINGS

000 (I, II) CHORUS

3 hours, 1 credit

111 (I), 112 (II) INTRODUCTION TO MUSIC

Basis music materials, principles of design, and the cultural significance of representative works in historical sequence. Designed primarily for non-music majors.
3 hours, 4 credits

121 (I), 122 (II) FIRST YEAR THEORY AND COMPOSITION

Harmony, melody, and music theory.

3 hours, 4 credits

Prerequisite permission of instructor.

Mr. Prins

131 (I), 132 (II) ELEMENTS OF MUSIC

The function of scales, intervals, triads, chords in root position and inversions. Use of nonharmonic tones and modulation, correlated sight-singing, ear training, dictation, analysis and keyboard drill. Designed primarily for music majors.

4 hours, 1 laboratory hour, 4 credits

Staff

221 (I), 222 (II) SECOND YEAR

THEORY AND COMPOSITION

Counterpoint in the 17th, 18th and 20th centuries (221). The study of harmony after 1850—emphasis on the 20th century (222).
3 hours, 3 credits

Prerequisite: Music 122

Mr. Huggler

231 (I) DEVELOPMENT OF CHAMBER MUSIC

Selected works from Haydn to Schonberg, centering chiefly on the medium of string quartet.

3 hours, 3 credits

Prerequisite: Music 111 or equivalent

Mr. Huggler

241 (I) 19TH CENTURY AMERICAN MUSIC

The growth and development of American music to the year 1900 (Charles Ives) in both its rural-folk and its urban aspects.

3 hours, 3 credits

Mr. Tawa

242 (II) 20TH CENTURY AMERICAN MUSIC

The present day ferment in American music, and the gradual emergence of American composers of international stature.

3 hours, 3 credits

Mr. Tawa

251 (I) HISTORY AND DEVELOPMENT OF JAZZ IN AMERICA

The development of jazz from its origin to the present.

3 hours, 3 credits

Prerequisite: Music 111 or permission of instructor

Mr. Huggler

252 (II) THE HISTORY OF NON-JAZZ BLACK MUSIC

The varieties of Negro music found in popular, religious, minstrel show and formal music.

3 hours, 3 credits

Staff

262 (II) MUSIC IN THE 20TH CENTURY

The various directions taken by music since 1900.

3 hours, 3 credits

Prerequisite: Music 111

Mr. Huggler

271 (I) MUSIC OF THE CLASSICAL PERIOD

Music of the Classical Period with emphasis on Haydn and Mozart.

3 hours, 3 credits

Prerequisite: Music 111 or equivalent

Mr. Tawa

272 (II) THE MUSICAL WORKS OF
BEETHOVEN

Beethoven's musical works—his symphonies, quartets, and piano sonatas.

3 hours, 3 credits

Prerequisite: Music 111 or equivalent

Mr. Tawa

PHILOSOPHY

GEOFFREY CLIVE, P.H.D., JASPER HOPKINS, PH.D., *Associate Professors of Philosophy and Co-Chairmen of the Department*; HAROLD BRONK, S.T.B., RICHARD HORAK, M.A., BEATRICE NELSON, M.A., *Instructors in Philosophy*.

COURSE OFFERINGS

200 (I) INTRODUCTION TO
PHILOSOPHY

An introductory examination of the problems and scope of philosophy.

3 hours, 4 credits

Staff

201 (I) ANCIENT AND MEDIEVAL
PHILOSOPHY

Classical philosophy from pre-Socratic philosophers through Plato and Aristotle. The central issue of medieval philosophy as represented by the ideas of St. Augustine and St. Thomas Aquinas on reason and revelation, the status of universals, and proofs of God's existence.

3 hours, 4 credits

Prerequisite: Sophomore option, Junior standing, or permission of instructor

Staff

204 (II) INTRODUCTION TO LOGIC

Examination of the forms of valid reasoning, deductive and inductive, and of their role in reflective thinking. Discussion of the functions of language, informal fallacies, the syllogism, and other types of formal argument, methods of science and modern views of the nature of logic and its relation to other fields.

3 hours, 4 credits

Prerequisite: Sophomore option, Junior standing, or permission of instructor

Staff

205 (I) ETHICAL THEORY

Introduction to the main problems and theories of the nature, scope, and validation of value judgments related to moral actions. Readings from representative, traditional, and contemporary philosophers.

Prerequisite: Sophomore option, Junior standing, or permission of instructor

Staff

208 (I) CONTEMPORARY
PHILOSOPHY

The major philosophical movements of the 20th century, including pragmatism, naturalism, logical empiricism, analytic philosophy, existentialism, phenomenology.

3 hours, 3 credits

Prerequisite: Philosophy 201, 204, or 205

Staff

232 (II) MAJOR CURRENT OF 19TH
CENTURY THOUGHT

A consideration of German Idealism, Dialectical Materialism, Utilitarianism. Existentialism, Pragmatism and Vitalism.

3 hours, 3 credits

Prerequisite: Philosophy 201, 204, or 205

Staff

234 (II) MODERN PHILOSOPHY

Emphasis on the views of the Continental Rationalists (Descartes, Spinoza, Leibniz) and the British Empiricists (Locke, Berkeley, Hume) in relation to general intellectual developments from the Renaissance to the Enlightenment.

3 hours, 3 credits

Prerequisite: Philosophy 201, 204, or 205

Staff

245 (I) THEORY OF KNOWLEDGE

A philosophical consideration of knowledge: its nature, forms, methods, scope, and validation.

3 hours, 3 credits

Prerequisite: Philosophy 201, 204, or 205

Staff

246 (II) PHILOSOPHY OF SCIENCE

An examination of the nature of scientific explanation, with attention to the social and philosophical consequences of scientific achievement.

3 hours, 3 credits

Prerequisite: Philosophy 201, 204, or 205

Staff

247 (I) PROBLEMS IN METAPHYSICS

An in-depth examination of key ideas as they appear in several major metaphysical systems.

3 hours, 3 credits

Prerequisite: Philosophy 201 or 234

Staff

251 (I) PLATO

A comprehensive study of the dialogues of Plato, with particular attention to their ethical, metaphysical and epistemological reflections and arguments.

3 hours, 3 credits

Prerequisite: Philosophy 201, 204, or 205

Staff

262 (II) THE CRITICAL PHILOSOPHY OF IMMANUEL KANT

A detailed study of Kant's major work, *The Critique of Pure Reason*, with special attention to his epistemology and critique of metaphysics.

3 hours, 3 credits

Prerequisite: Philosophy 201, 204, or 205
Staff

270 (II) PHILOSOPHY OF MIND

Critical study of the nature of mind and its relation to body and matter, with specific emphasis on recent advances in philosophy and psychology.

3 hours, 3 credits

Prerequisite: Philosophy 200
Staff

280 (I) SOCIAL AND POLITICAL PHILOSOPHY

An introduction to representative problems and themes of social and political philosophy, especially the concepts of human rights, liberty, justice, equality, law, social obligation, and the social contract.

3 hours, 3 credits

Prerequisite: Philosophy 201, 204, or 205
Staff

281 (I) PHILOSOPHY OF EDUCATION

An examination of philosophical ideas and concepts relevant to the nature and aims of education.

3 hours, 3 credits

Staff

291 (I) EXISTENTIALISM

An examination of major forces and concepts in the development of existentialism.

3 hours, 3 credits

Prerequisite: Philosophy 201 or 205 or permission of instructor
Mr. Clive

RUSSIAN

ANNY NEWMAN, M.A., GEORGE N. KOSTICH, M.A., *Instructors in Russian.*

COURSE OFFERINGS

111(I), 112 (II) ELEMENTARY RUSSIAN

For students who have had no previous training in Russian. Development of the four language skills, based on an audio-lingual approach.

4 hours, 2 hours laboratory

4 credits
Staff

121 (I), 122 (II) INTERMEDIATE RUSSIAN

Intensive review of grammar. Continued practice in speaking, writing and listening.

4 hours, 4 credits

Prerequisite: Russian 122 or equivalent
Staff

231 (I), 232 (II) INTRODUCTION TO RUSSIAN LITERATURE

Reading of selected classics of 19th and 20th century Russian literature, combined with written and oral work.

3 hours, 3 credits

Prerequisite: Russian 122 or equivalent
Mrs. Newman

241 (II) THE SOUND PATTERNS OF RUSSIAN

Detailed analysis of the sound system, articulation and intonational patterns of the Russian language. Emphasis on aural comprehension and oral fluency.

3 hours, 3 credits

Prerequisite: Russian 122 or equivalent
Mrs. Newman

321 (I), 322 (II) RUSSIAN LITERATURE IN TRANSLATION

Modern Russian literature, concentrating on prose, from 1800 to the present. No reading knowledge of Russian required.

3 hours, 3 credits

Prerequisite: English 102 or permission of instructor
Staff

331 (I), 332 (II) RUSSIAN STYLISTICS

A systematic study of the style of Russian literary works. Practical application of principles of grammar and intensive study of idiomatic expressions.

3 hours, 3 credits

Prerequisite: Russian 232 or equivalent
Mr. Kostich

353 (I) DOSTOEVSKY

Historical and literary background. No reading knowledge of Russian required. Russian majors will be expected to do a part of the reading in the original.

3 hours, 3 credits

Prerequisite: Sophomore standing
Staff

354 (II) TOLSTOY

Historical and literary background. No reading knowledge of Russian required. Russian majors will be expected to do a part of the reading in the original.

3 hours, 3 credits

Prerequisite: Sophomore standing
Mr. Kostich

355 (II) SOVIET LITERATURE

Beginnings and development of Soviet prose, drama and criticism from Gorky to the present. No reading knowledge of Russian required. Majors required to do research in Russian.

3 hours, 3 credits

Prerequisite: Sophomore standing Staff

356 (I) RUSSIAN DRAMA

The masterpieces of the Russian theatre from the beginnings to recent years. Plays from Fonvizin to Gorky. No reading knowledge of Russian required. Russian majors expected to do a part of the reading in the original.

3 hours, 3 credits

Prerequisite: Sophomore standing
Mr. Kostich

SPANISH

JAMES RYAN, PH.D., *Associate Professor of Spanish and Chairman of the Department*; MARIA C. ZARDOYA, PH.D., *Professor of Spanish*; LUIS R. ALONSO, PH.D., *NELLIE SANCHEZ-ARCE, PH.D., Associate Professors of Spanish*; ROSALIND COHEN GABIN, PH.D., *MARIA-LUISA OSORIO, PH.D., ADORNA WALIA, PH.D., Assistant Professors of Spanish*; HILTON HALL, M.A.T., *MARIA LUISA ROBERTS, B.S., Instructors in Spanish*; JOSE DE JESUS BARBA-MARTIN, M.A., *Part-time Instructor in Spanish*; IVONNE BUCK, Ed.M., *ALAN FRANCIS, M.A., Lecturers in Spanish*; JOSE L. GUZMAN, M.A., *SUSANA HERZ, B.A., Part-time Lecturers in Spanish.*

GRADUATION REQUIREMENTS

Spanish majors are required to take Spanish 311, 312, and at least eight additional semesters of advanced courses, including two semesters of Spanish-American Literature and one semester of Cervantes (Spanish 336). Majors are strongly advised to take Advanced Spanish Grammar and Composition and Conversation before taking advanced literature courses.

Majors who plan to go on for a higher degree in Spanish are advised to take two semesters of Golden Age Literature, with at least one semester in the Comedia (drama).

Second semester Seniors must take a comprehensive examination in Spanish covering three specific fields of Hispanic Literature (the three fields to be chosen by the student). Majors will also be expected to have a general knowledge (literary, history, movements, etc.) of Hispanic Literature.

Students may receive 3 credits toward their total of 24 major credits for acceptable work on an Honors Thesis written under the direction of an adviser from the Spanish faculty.

COURSE OFFERINGS

111 (I), 112 (II) ELEMENTARY SPANISH

For students who have no creditable training in Spanish. An intensive study of the four language skills based on an audio-lingual approach.

4 hours, 2 hours laboratory

4 credits Staff

121 (I), 122 (II) INTERMEDIATE SPANISH

An oral review and further study of the language skills with readings in Spanish and Spanish-American literature and culture.

4 hours, 4 credits

Prerequisite: Spanish 112 or equivalent Staff

231 (I) INTRODUCTION TO SPANISH CULTURE

Selected readings in the literature and culture of the Hispanic world. Oral reports and papers based on the readings required.

3 hours, 3 credits

Prerequisite: Spanish 122 or equivalent Staff

232 (II) INTRODUCTION TO SPANISH-AMERICAN CULTURE

Selected readings in the literature and culture of the Spanish-American world. Oral reports and papers based on the readings.

3 hours, 3 credits

Prerequisite: Spanish 122 or equivalent Staff

301 (I) ADVANCED SPANISH GRAMMAR

An intensive study of Spanish grammar and syntax with emphasis on written exercises, themes, and papers.

3 hours, 3 credits

Prerequisite: Spanish 122 or equivalent
Mrs. Walia

302 (II) SPANISH COMPOSITION
AND CONVERSATION

Intensive work in written and oral Spanish: weekly themes and frequent oral reports and speeches. Although Advanced Spanish Grammar is not a prerequisite, 302 is planned as a continuation of the work of Spanish 301.
3 hours, 3 credits

Prerequisite: Spanish 122 or equivalent
Mr. Barba-Martin

311 (I), 312(II) SURVEY OF SPANISH
LITERATURE

Intensive reading of masterpieces of Spanish literature. Written and oral reports required.
3 hours, 3 credits

Prerequisite: Spanish 122 or equivalent, and permission of instructor
Mr. Alonso

321 SPANISH CIVILIZATION

Studies in Spanish history, art, architecture, and music as a background for literature; readings, discussions, papers.
3 hours, 3 credits

Prerequisite: Spanish 122 or equivalent
Not offered 1970-71

322 SPANISH-AMERICAN
CIVILIZATION

Major aspects of the cultural evolution of the Spanish-American countries from pre-Hispanic days to the present.
3 hours, 3 credits

Prerequisite: Spanish 122 or equivalent
Not offered 1970-71

331 POETRY OF THE GOLDEN AGE

Selections include Garcilaso, Gongoro, Herrera, Fray Louis de Leon, San Juan de la Cruz, Lope de Vega, and Quevedo.
3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Not offered 1970-71

332 GOLDEN AGE PROSE

Selections from various forms of Spanish prose such as pastoral, and Moorish novel, or moral, mystical, and satiric prose.
3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Not offered 1970-71

333 (I), 334 (II) GOLDEN AGE
THEATRE

Intensive study of outstanding dramatists of the 16th and 17th centuries: Torres Naharro, Gil Vicente, Lope de Rueda, Juan de la Cueva, Cervantes, Lope de Vega, Guillén de Castro, Mira de Amescua, Tirso de Molina, Ruiz de Alarcón, Calderón de la Barca, Rojas Zorrilla, Moreto and others.
3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Miss Sanchez-Arce

335 (I) CERVANTES

An intensive study of the works of Cervantes with the exclusion of *Don Quijote*.
3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Miss Zardoya

336 (II) CERVANTES

An analytical study of *Don Quijote*.
3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Miss Zardoya

337 THE PICARESQUE NOVEL

An intensive study of the major picaresque novels of the 16th and 17th centuries: *Lazarillo de Tormes*, *Guzmán de Alfarache*, *La Vida del Buscón*, and others.
3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Not offered 1970-71

341 NINETEENTH CENTURY POETRY
AND THEATRE

Selections of poetry and theatrical works of both the Romantic and Realistic periods.
3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Mr. Navas-Ruiz

342 NINETEENTH CENTURY PROSE

Selections from costumbristic writers such as Larra and Masonero Romanos, and novelists such as Alarcón, Galdós, Pereda and Valero.
3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Mr. Navas-Ruiz

343 GALDÓS

Selected works of Spain's greatest modern novelist.
3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Not offered 1970-71

351 (I), 352 (II) THE GENERATION
OF 1898

Selections from Canivet, Unamuno, Valle Inclán, Baroja, Azorín, Machado, Miró, Pérez de Ayala, and Ortega.
3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Miss Zardoya

353 TWENTIETH CENTURY SPANISH
POETRY

Selected readings from Juan Ramón Jiménez, the poets of the Generation of 1927, and the post-war generation.
3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Not offered 1970-71

354 TWENTIETH CENTURY SPANISH THEATRE

Selected readings from the works of the major dramatists of the 20th century.

3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Staff

355 (I) TWENTIETH CENTURY SPANISH FICTION

Selected readings from the works of the major novelists and short story writers of the 20th century.

3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Mrs. Osorio

361 SPANISH LITERATURE BEFORE 1500

Readings from El Cid through the *Celestina*, including such works as *Libre de Buen Amor*, *El Conde Lucanor*, romances, and the poetry of El Marqués de Santillana, Jorge Manrique and others.

3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Not offered 1970-71

371 (I), 372 (II) SURVEY OF SPANISH-AMERICAN LITERATURE

Masterpieces from the Colonial period to the 20th century examined against the background of historical events, social pressures, and European literary movements.

3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Mrs. Walia

373 MODERN SPANISH-AMERICAN NOVEL

Extensive readings in the great works of contemporary Spanish-American prose. Concentrates on the major themes of man against nature, man against society, "indigenismo", "criollismo".

3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Mr. Navas-Ruiz

374 CONTEMPORARY SPANISH-AMERICAN FICTION

Spanish-American prose fiction from Borges to present day writers.

3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Mr. Navas-Ruiz

375 SPANISH-AMERICAN ESSAY

Selected readings from the works of the major essayists of the 19th and 20th centuries.

3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Not offered 1970-71

376 CONTEMPORARY SPANISH-AMERICAN POETRY

Selections of Spanish-American poetry from Modernism to the present.

3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Not offered 1970-71

377 MODERNISM

Modernist writers beginning with Rubén Darío and including poetry and prose of both Spain and Spanish America.

3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Not offered 1970-71
Staff

381 STUDIES IN SPANISH LITERATURE

In-depth study of special topics or individual authors; topics will vary from year to year.

3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Not offered 1970-71
Staff

382 STUDIES IN SPANISH-AMERICAN LITERATURE

In-depth study of special topics or individual authors; topics will vary from year to year.

3 hours, 3 credits

Prerequisite: Spanish 312 or equivalent
Not offered 1970-71
Staff

386 THE LEARNING AND TEACHING OF SECONDARY SCHOOL SPANISH

The issues, principles, and methods of secondary school Spanish teaching. Supervision and critique of practice teaching.

3 hours, 20 hours laboratory (practice teaching), 9 credits

Prerequisite: 6 hours Education courses and admission to Teacher Certification Program.
Staff

THEATRE ARTS

ROBERT R. EVANS, PH.D., LOUIS E. ROBERTS, PH.D., *Assistant Professors of Theatre Arts and Co-Chairmen of the Department.*

COURSE OFFERINGS

III (I) TRADITIONS OF WESTERN DRAMA

The intents, designs, and techniques of the drama of the Western World, from the classic Greek to the contemporary European and American theatre. Emphasis on the cultural environment of each of the major periods and locales of the drama and the relation of the theatre to its public.

3 hours, 4 credits

121 (I) THE STYLES AND TECHNIQUES OF COMEDY

The comic form, emphasizing different styles, techniques, motivations and degrees of effectiveness of various exemplary comic playwrights, especially in their relation to their audiences, actors, and theatre architecture.

3 hours, 4 credits

Prerequisite: Sophomore standing

Mr. Evans

122 (II) THE STYLES AND TECHNIQUE OF TRAGEDY

The evolution of the tragic form, emphasizing different styles, techniques, motivations and degrees of effectiveness of various exemplary tragic playwrights, especially in relation to their audience, actors, and theatre architecture.

3 hours, 3 credits

Prerequisite: Sophomore standing

Mr. Evans

212 (II) THEATRE OF SOCIAL PROTEST

An historical survey of the use of the theatre to challenge the values of society. The techniques of stagecraft used in different periods to reveal conflict in society, dramatize contemporary issues, and influence public opinion.

3 hours, 3 credits

Prerequisite: Sophomore standing

Mr. Roberts

231 (I) WORKSHOP IN CLASSICAL DRAMA

Correlating selected texts of Greek or Roman drama with classical theories and methods of production. A survey of the production history of a work to be performed to observe how different ages have reflected themselves in classical drama. Students prepare director's notebooks, and participate in the production of one or more plays presented to the University community.

3 hours, 3 credits

Prerequisite: permission of instructor

Mr. Roberts

232 (II) WORKSHOP IN MODERN DRAMA

The texts of one or more plays written between 1870 and the present in preparation for performance. Attention to the playwright and his age, and to the various styles in which the work has been performed. Students participate in all aspects of course productions prepared for the University community.

3 hours, 3 credits

Prerequisite: permission of instructor

Mr. Evans

235 (II) INTRODUCTION TO DIRECTING

The understanding of dramatic form required in directing. A survey of theories of production and the director's function. A study of artistic creation fusing the spoken word, movement, gesture, sound, light, color, fabric, design and architecture.

3 hours, 3 credits

Prerequisite: permission of instructor

Mr. Roberts

251 (I) PLAYWRITING

Writing for the theatre, including examination of model one-act and three-act plays by major contemporary writers, selected readings on the craft of playwriting, and completion of an original play begun in class.

3 hours, 3 credits

Prerequisite: Sophomore standing

Mr. Evans

DIVISIONAL COURSES IN HUMANITIES

CLASSICS 331 (I), 332 (II) GREEK AND ROMAN CIVILIZATIONS

A survey of the literature, philosophy and art of Greece and Rome in their historical setting. In English. See Department of Classics.

3 hours, 3 credits

Mrs. Foggoli

FRENCH 261 (I) MODERN FRENCH NOVEL IN TRANSLATION: 1900-1935

Works by French writers, 1900 to 1935.

3 hours, 3 credits

Prerequisite: English 111 or permission of instructor

Mr. Proulx

FRENCH 262 (II) MODERN FRENCH NOVEL IN TRANSLATION: 1935 TO THE PRESENT

Works by French writers from 1935 to the present day.

3 hours, 3 credits

Prerequisite: English 111 or permission of instructor

Mr. Proulx

FRENCH 263 (I) THE BLACK SOUL AND THE THEATRE

A comparative approach to the image of the Black man in contemporary theatre. An analytical and comparative study of various French and American plays by both white and black writers.

3 hours, 3 credits

Prerequisite: English 111 and reading knowledge of French (some of the French plays not being available in English translation)

Mr. Sarotte

GERMAN 251 (I) MODERN GERMAN
IN TRANSLATION

Translated representative selections from
major German authors.

See Department of German.

3 hours, 3 credits

Prerequisite: English 111 or permission of
instructor Staff

HUMANITIES 241 (I)
INTRODUCTION TO BIBLICAL
LITERATURE: OLD TESTAMENT

Reading of representative texts for the Old
Testament and introduction of the character-
istic problems in interpreting those texts.

3 hours, 3 credits Staff

HUMANITIES 242 (II)
INTRODUCTION TO BIBLICAL
LITERATURE: NEW TESTAMENT

Reading of representative texts for the New
Testament and introduction to the character-
istic problems in interpreting those texts.

3 hours, 3 credits Staff

HUMANITIES 243 (I) MYTHOLOGY
AND LITERATURE

Classical, Celtic and other myths and their
persistence and transformation in subsequent
literature.

3 hours, 3 credits

Prerequisite: English 111 Staff

HUMANITIES 244 (II) NORSE
MYTHOLOGY AND LITERATURE

Norse literature, focusing on the *Prose Edda*
of Snorri Sturluson and on Sagas. Consider-
ation of the nature of myth and the survival
of Norse myth in post-pagan folklore and
literature.

3 hours, 3 credits

Prerequisite: English 111 Staff

HUMANITIES 247 (II) READINGS
IN EUROPEAN FICTION

The art and the thought of major European
novelists, including Dostoevsky, Tolstoy,
Flaubert, Stendhal, Gide, Mann, and Kafka.

3 hours, 3 credits

Prerequisite: English 111 Mr. Stock

HUMANITIES 249 (I, II)
AFRICAN LITERATURE

A survey of African literature. Includes such
writers as Yacine, Bourboune, Ouloguem,
Soyinka, Ngugi, p'Bitek, Paton and
Abrahams.

3 hours, 3 credits

Prerequisite: English 111

Mr. Armah, Mr. Senna

HUMANITIES 252 (I) FILM STUDY I

An introduction to the history and art of the
film. Viewing and discussion of representa-
tive experimental, documentary, and feature
films, and reading in the literature of the
film. Critical papers required.

3 hours, 3 credits

Prerequisite: English 111 Mr. Risse

HUMANITIES 253 (II)
FILM STUDY II

Work in both film analysis and film making:
detailed study of selected major works chiefly
from the contemporary cinema, and a proj-
ect in sound film production.

3 hours, 3 credits

Prerequisite: Humanities 252 and permission
of the instructor Mr. Risse

HUMANITIES 254 (II) ROMANTICISM
IN ITS EUROPEAN CONTEXT

The development of Romanticism in Europe.

3 hours, 3 credits

Prerequisite: English 111 Mr. Ott

HUMANITIES 255 (I) HESSE, MANN
AND THE MODERN ROMANTIC
IMAGINATION

Major works of Hesse and Mann in the con-
text of historical Romanticism.

3 hours, 3 credits

Prerequisite: English 111 and permission of
instructor Mr. Dhority

HUMANITIES 386 (I, II) TEACHING
OF A SECONDARY SCHOOL
FOREIGN LANGUAGE

The issues, principles, and methods of
secondary foreign language teaching. Super-
vision and critique of practice teaching. See
individual departments, or Teacher Certifi-
cation Program.

3 hours, 20 hours laboratory (practice teach-
ing), 9 credits

Prerequisite: 6 hours Education courses and
admission to the Teacher Certification Pro-
gram Staff

RUSSIAN 321 (I), 322 (II) RUSSIAN
LITERATURE IN TRANSLATION

Modern Russian literature, concentrating on
prose, from 1800 to the present. No reading
knowledge of Russian required.

3 hours, 3 credits

Prerequisite: English 102 or permission of
instructor Staff

RUSSIAN 353 (I) DOSTOEVSKY

Historical and literary background. No read-
ing knowledge of Russian required.

3 hours, 3 credits

Prerequisite: Sophomore standing Staff

RUSSIAN 354 (II) TOLSTOY

Historical and literary background. No reading knowledge of Russian required.

3 hours, 3 credits

Prerequisite: Sophomore standing

Mr. Kostich

RUSSIAN 355 (II) SOVIET LITERATURE

Beginnings and development of Soviet prose, drama and criticism from Gorky to the present. No reading knowledge of Russian required.

3 hours, 3 credits

Prerequisite: Sophomore standing

Staff

RUSSIAN 356 (I) RUSSIAN DRAMA

Study of the masterpieces of the Russian theatre from the beginnings to recent years. Plays from Fonvizin to Gorky. No reading knowledge of Russian required.

3 hours, 3 credits

Prerequisite: Sophomore standing

Mr. Kostich

SPANISH 261 (I) SPANISH MASTERPIECES IN TRANSLATION

Studies of outstanding works of Spanish literature from the Middle Ages through the Renaissance and the Golden Age to modern times. No knowledge of Spanish required. Not open to Spanish majors.

3 hours, 3 credits

Prerequisite: English 111 or permission of instructor

Mr. Ryan

SPANISH 262 (II) MODERN SPANISH-AMERICAN LITERATURE IN TRANSLATION

The works of some of the outstanding Spanish-American writers of the 20th century. No knowledge of Spanish required.

3 hours, 3 credits

Prerequisite: English 111 or permission of instructor

Mrs. Walia

Mathematics

TAFFEE T. TANIMOTO, PH.D., *Professor of Mathematics and Chairman of the Division*; ALFONSO G. AZPETIA, PH.D., HERBERT KANOWITZ, PH.D., *Professors of Mathematics*; ERNEST ELYASH, PH.D., JOHN A. LUTTS, PH.D., JUAN CARLOS MERLO, PH.D., STEPHEN PARROTT, PH.D., GEZA SCHAY, PH.D., *Associate Professors of Mathematics*; JAMES S. BYRNES, PH.D., SO-FEI FANG, PH.D., LAZARO RECHT, PH.D., HELEN SKALA, PH.D., MICHAEL

TOMLINSON, PH.D., SHERWOOD WASHBURN, PH.D., JAMES WHITNEY, PH.D., *Assistant Professors of Mathematics*; CARL COHEN, M.A., COLIN GODFREY, M.A., MARC LEVINE, M.A., JOSEPH RUSSELL, M.A., DENNIS WORTMAN, B.S., *Instructors in Mathematics*; ROBERT MACKENZIE, PH.D., *Part-time Professor of Mathematics*; NOEL CARRERE, B.S., *Part-time Instructor in Mathematics*.

GRADUATION REQUIREMENTS

The B.A. degree with a major in Mathematics will be awarded upon the satisfactory completion of the core requirements, of which the Science requirement must be Physics 111 and 112, and Math 105, Math 106, Math 150, Math 151 and 8 courses beyond the Math 151 level. Mathematics majors should start with Math 105 in their Freshman year.

NOTE: Mathematics credits are not required for graduation except for majors in those departments stipulating otherwise.

COURSE OFFERINGS

NOTE: Prerequisite for all Math courses is preferably two years of Algebra and one year of Plane Geometry.

100 (I, II) LIBERAL ARTS MATHEMATICS I

An historical-cultural survey of the main areas of mathematics. Emphasizes the interplay of these areas with man's philosophic, artistic, commercial, and scientific pursuits.

3 hours, 4 credits

Staff

101 (I, II) LIBERAL ARTS MATHEMATICS II

A primarily descriptive survey of several areas of mathematics. Stresses understanding through concrete examples. Topics include elementary number theory, elementary finite group and non-Euclidean geometry and how they relate to the physical world.

3 hours, 4 credits

Staff

102 (I, II) FINITE MATHEMATICS

For non-science or non-mathematics majors. Topics include elementary set theory; combinations, permutations and other "counting" formulas; discrete probability theory; random variables and their distributions.

3 hours, 4 credits

Staff

103 (I, II) PRE-CALCULUS
MATHEMATICS

For students who desire to enter the Calculus sequence.

3 hours, 4 credits

Staff

104 (I, II) SURVEY OF CALCULUS

Calculus developed intuitively and applied to problems in geometry, physics, and probability. A terminal course for non-science and non-mathematics majors.

3 hours, 4 credits

Staff

105 (I, II) CALCULUS I

The first in the calculus sequence of courses for science and mathematics majors. Starts with the basic concepts of functions and limits. Topics include derivatives and their applications and definite and indefinite integrals with application to geometrical and physical problems, discussing simple algebraic and transcendental functions.

3 hours, 4 credits

Prerequisite: Math 103 or equivalent

Staff

106 (I, II) CALCULUS II

A continuation of Math 105. Topics are integration, applications of the integral, sequences and series.

3 hours, 4 credits

Prerequisite: Math 105 or equivalent

Staff

111 (I) UNIFIED CALCULUS I

The first semester of a two semester concentrated calculus sequence for science and mathematics majors. Begins with the basic concepts of functions and limits. Topics include derivatives and their applications. The definite and indefinite integrals with applications to geometrical, statistical and physical problems. Detailed consideration of transcendental functions, sequences and series.

5 hours, 5 credits

Staff

112 (II) UNIFIED CALCULUS II

Continuation of Math 111. Topics include vector calculus and an elementary introduction to linear algebra. Multivariate calculus including differentiation and multiple integration with applications to many fields concluding with a short introduction to differential equations.

5 hours, 5 credits

Staff

150 (I, II) CALCULUS III

An introduction to linear algebra with applications to matrix differential and integral operators, sequences and series, partial differentiation and application to multivariate calculus and geometry.

3 hours, 4 credits

Prerequisite: Math 106 or equivalent

Staff

151 (I, II) DIFFERENTIAL
EQUATIONS AND ALLIED TOPICS

Linear differential equations of the first and second order, general theory of linear differential equations, matrix equations and physical applications.

3 hours, 4 credits

Prerequisite: Math 150 or equivalent

Staff

152 (I, II) LINEAR ALGEBRA I

Vectors, vector spaces, matrices, linear and bilinear mappings. Numerical aspects of matrix inversion and the associated eigen-value and eigenvector determinations.

3 hours, 4 credits

Prerequisite: Math 106 or equivalent

Staff

153 (I, II) LINEAR ALGEBRA II

Groups, rings, polynomials, differential and integral linear operators; an introduction to inner spaces, exterior forms and multilinear algebra.

3 hours, 4 credits

Prerequisite: Math 152

Staff

201 (I) ADVANCED CALCULUS I

Implicit function theorem, multiple integration, vector calculus, Green's Theorem, Stokes' Theorem.

3 hours, 3 credits

Prerequisite: Math 151

Staff

202 (II) ADVANCED CALCULUS II

Continuous functions, convergence, differentiability, measure and integration, and various superficial aspects of real variable theory.

3 hours, 3 credits

Prerequisite: Math 201

Staff

203 (I) ABSTRACT ALGEBRA I

Sets in logic, integers and congruences, lattices, finite groups.

3 hours, 3 credits

Prerequisite: Math 151

Staff

204 (II) ABSTRACT ALGEBRA II

Rings, fields, vector spaces and quadratic forms, structure of groups, and introduction to multilinear algebra.

3 hours, 3 credits

Prerequisite: Math 203

Staff

205 (I) PROBABILITY AND
STATISTICS I

An introduction to statistical concepts, central limit theorem, elementary measure, finite and continuous probability.

3 hours, 3 credits

Prerequisite: Math 151

Staff

206 (II) PROBABILITY AND STATISTICS II

Stochastic processes and time series analyses.
3 hours, 3 credits
Prerequisite: Math 205 Staff

251 (I) AN INTRODUCTION TO REAL ANALYSIS

Real numbers, topology of reals, infinite series, continuity, Weierstrass approximation, differentiation, integration, power series and orthonormal systems.
3 hours, 3 credits
Prerequisite: Math 202 Staff

252 (II) AN INTRODUCTION TO COMPLEX ANALYSIS

Complex numbers, complex functions, power functions, trigonometric functions, Möbius transformations. Differentiation and integration of analytic functions, Cauchy's Theorem, residues, series and singularities and meromorphic functions.
3 hours, 3 credits
Prerequisite: Math 202 Staff

253 (I) TOPICS IN GEOMETRY I

Topics in classical Euclidean and non-Euclidean geometries, projective geometry, lattices and finite geometries.
3 hours, 3 credits
Prerequisite: Math 153 or 204 Staff

254 (II) TOPICS IN GEOMETRY II

An introduction to classical differential geometry with corresponding modern algebraic approaches leading to an introduction to Riemannian geometry. Techniques involve tensor analysis and multilinear algebra.
3 hours, 3 credits
Prerequisite: Math 204 Staff

255 (I) MATHEMATICAL LOGIC

Formal theories, consistency, completeness, decidability, Gödel's incompleteness theorem for first order arithmetic (Peano number theory). Introduction to axiomatic set theory, ordinal numbers and cardinal numbers.
3 hours, 3 credits
Prerequisite: Math 151 Staff

262 (I) TOPOLOGY

Topological spaces, convergence and continuity, compactness and connectedness properties; introduction to Homotopy theory and combinatorial topology.
3 hours, 3 credits
Prerequisite: 1 semester of Advanced Calculus Staff

264 (I, II) NUMERICAL ANALYSIS

Approximations of roots, finite differences, interpolation, numerical solutions of differential equations and algebraic equations. Students will have access to computer terminal.
3 hours, 3 credits
Prerequisite: Math 151 Staff

290 (I) READING IN MATHEMATICS

Advanced level study of various topics according to individual interests. Open only to those students who have proven capabilities in mathematics.
3 hours, 3 credits
Prerequisite: permission of the Department Staff

386 (II) LEARNING AND TEACHING OF SECONDARY SCHOOL MATHEMATICS

Required for Math secondary teaching certification; also satisfies methods course required by Massachusetts for teaching. Advanced plane geometry and application with generalized interpretations of elementary high school topics. Algebraic topics such as symmetric functions, cyclic groups and algebraic number fields and their extensions, and classical standard problems, e.g., duplication of the cube, trisection of an angle and squaring the circle.
3 hours, 20 hours laboratory (practice teaching), 9 credits
Prerequisite: Math 151 and 6 hours Education courses Staff

**MATHEMATICS
GRADUATE EXTENSION
COURSES**

511 (I), 512 (II) INTRODUCTION TO MODERN ALGEBRA

Groups, rings, algebras, fields, modules, linear transformations and matrices, tensor products, homological algebra.
3 credits per semester
Prerequisite: Math 202 or equivalent Staff

521 (I), 522 (II) THEORY OF FUNCTIONS OF A COMPLEX VARIABLE

Linear transformations of a complex variable, power series and elementary functions, holomorphic functions and Cauchy's Theorem, theory of residues, isolated singularities, conformal mappings, entire and meromorphic functions and their representations by means

of products and partial fractions, elliptic functions, analytic continuation and Riemann surfaces, algebraic functions.

3 credits per semester

Prerequisite: Math 202 or equivalent Staff

523 (I), 524 (II) THEORY OF FUNCTIONS OF A REAL VARIABLE

The real number system, Lebesgue measure and the Lebesgue integral, differentiation, the classical Banach spaces, general measure, and the integration theory.

3 credits per semester

Prerequisite: Math 202 or equivalent Staff

Natural Sciences

BIOLOGY

LAWRENCE KAPLAN, Ph.D., *Professor of Biology and Chairman of the Department*;

HERBERT LIPKE, Ph.D., NEVIN WEAVER, Ph.D., *Professors of Biology*; JOHN A. FREEBERG, Ph.D., FUAD M. SAFWAT, Ph.D., *Associate Professors of Biology*;

RUTH R. BENNETT, Ph.D., MARTHA BETH-ELL, Ph.D., STUART W. BRADFORD, Ph.D., ELIZABETH A. DAVIS, Ph.D., BETTINA HARRISON, Ph.D., CHRISTINE KIBEL, Ph.D., STANLEY KRANE, Ph.D., LORRAINE LARSON, Ph.D., ELIZABETH LOW, Ph.D., JOHN H. SCHULTZ, Ph.D., EDNA SEAMAN, Ph.D., CLAIRE VAN UMMERSEN, Ph.D., FRANCOIS VUILLEUMIER, Ph.D., *Assistant Professors of Biology*; N. SANDRA BROWN, M.A., RICHARD STONE, M.A., WESLEY N. TIFFNEY, M.S., *Instructors in Biology*; VORSILA BOHRER, Ph.D., PATRICIA BRENNAN, M.S., PRISCILLA E. DOFF, B.S., JEREMY HATCH, Ph.D., KATHERINE HECKSHER, M.S., SHIRLEY L. MAINA, M.S., *Lecturers in Biology*.

GRADUATION REQUIREMENTS

Biology majors must choose either Option A (those who plan to enter secondary teaching with a bachelor's degree or who do not now plan graduate or professional work), or Option B (those who plan graduate or professional studies).

All majors are required to take Biology 101-102, Chemistry 103-104, one year of Introductory Physics, two years of Advanced Biology (211-212, 241-242,

271-272, or 371-372) and one year of mathematics (preferably Math 105-106, especially for Option B majors).

In addition, Option A majors must take one year of other advanced Biology, and Option B majors, one year of Organic Chemistry. Most Option B majors are advised to choose Biology 371-372 instead of 271-272, and to elect Physical Chemistry.

COURSE OFFERINGS

101 (I), 102 (II) GENERAL BIOLOGY

An integrated course stressing the principles of biology. Life examined at the molecular, cellular, organismal and population level and structure considered in relation to function or biological principles. Emphasis on evolution as the major unifying principle of biology.

3 hours, 1 hour discussion, 2 hours laboratory, 4 credits Staff

211 (I) BIOLOGY OF ORGANISMS

Reproduction, growth and development in the major groups of protists, plants and animals. Plant structure and function.

3 hours, 6 laboratory hours, 5 credits Prerequisite: Biology 102 Staff

213 (I) BIOLOGY OF ORGANISMS

The lecture portion of Biology 211.

3 hours, 3 credits Prerequisite: Biology 102 Staff

212 (II) BIOLOGY OF ORGANISMS (II)

A continuation of Biology 211 with the emphasis on maintenance, integration and responses to environment in animals.

3 hours, 6 laboratory hours, 5 credits Prerequisite: Biology 211 or permission of instructor Staff

214 (II) BIOLOGY OF ORGANISMS (II)

The lecture portion of Biology 212.

3 hours, 3 credits Prerequisite: Biology 213 or permission of instructor Staff

241 (I) BIOLOGY OF POPULATIONS

Animal and plant populations considered in terms of their ecology and their probability and population genetics. Field trips, laboratory experiments in interspecific competition, behavior and genetics.

3 hours, 6 laboratory hours, 5 credits Prerequisite: Biology 102 or permission of instructor Staff

243 (I) BIOLOGY OF POPULATIONS

The lecture portion of Biology 241.

3 hours, 3 credits

Prerequisite: same as 241

Staff

242 (II) BIOLOGY OF POPULATIONS (II)

A continuation of Biology 241. Population genetics and variation; reproductive isolation and evolution of behavior. Species formation in animals and plants. Field trips and individual or group projects in the laboratory and in the field.

3 hours, 6 laboratory hours, 5 credits

Prerequisite: Biology 241 or 243 or permission of instructor

Staff

244 (II) BIOLOGY OF POPULATIONS (II)

The lecture portion of Biology 242.

3 hours, 3 credits

Prerequisite: same as 242

271 (I) BIOLOGY OF CELLS

(includes eight lectures on fundamentals of Organic Chemistry)

271 (I) BIOLOGY OF CELLS

(includes eight lectures on fundamentals of Organic Chemistry)

371 (I) BIOLOGY OF CELLS

(prerequisite or corequisite: Chemistry 153-54 or 155-56)

The cytology and fine structure of cells in relation to the production of energy for growth and reproduction. The chemistry of the life process considered in detail as a tool for inquiry into current problems in biology. The specialization of cells and their integration in tissues.

3 hours, 6 laboratory hours, 5 credits

Prerequisite: Biology 101-02; Chemistry 102 or 104

Staff

273 (I) AND 373 (I) BIOLOGY OF CELLS

The lecture portion of Biology 271 and 371. 3 hours, 3 credits

Prerequisite: same as 271 and 371

Staff

272 (II) AND 372 (II) BIOLOGY OF CELLS

The physical and chemical basis of inheritance and the exchange of genetic information between cells. The control of biochemical systems and energy transformations. The mechanism of synthesis of protoplasm and the malfunctions encountered in living systems.

3 hours, 6 laboratory hours, 5 credits

Prerequisite: Biology 271 or 371 or permission of instructor

Staff

274 (II) AND 374 (II)

The lecture portion of Biology 272 and 372.

3 hours, 3 credits

Prerequisite: same as Biology 272 and 372

Staff

350 FIELD BIOLOGY ON NANTUCKET (Summer)

Students prepare written reports on original research projects on the field biology of Nantucket Island. The course meets each weekday from late July through August at the University of Mass. Research Center on Nantucket. Lectures, seminars and individual consultations arranged. Mainland students live at the Center and are responsible for modest expenses.

6 credits

Prerequisite: Biology 102 and permission of instructor

Staff

351 (I, II) TOPICS IN BIOLOGY

Detailed examination of a narrow field of biology. Several topics may be offered each semester.

1 hour, 1 credit

Prerequisite: permission of instructor

Staff

391 (I), 392 (II) HONORS IN BIOLOGY

Laboratory or library research under the guidance of a faculty adviser, resulting in a thesis presented to the Biology staff.

1 to 3 credits

Prerequisite: Honor standards, senior standing, permission of honors committee

Staff

386 (II) THE LEARNING AND TEACHING OF BIOLOGY

The issues, principles and methods of teaching Biology in the schools. Supervision and critique of practice teaching. Biology majors are advised to check scheduling practice teaching with department.

3 hours, 20 hours laboratory (practice teaching), 9 credits

Prerequisite: 6 hours Education courses and admission to Teacher Certification Program

Staff

CHEMISTRY

ERNEST I. BECKER, PH.D., *Professor of Chemistry and Chairman of the Department*; J-P. ANSELME, PH.D., *Professor of*

Chemistry; WALTER J. LEHMANN, PH.D., THOMAS N. MARGULIS, PH.D., LOWELL SCHWARTZ, SC.D., CHI-HUA WANG, PH.D., LEVERETT J. ZOMPA, PH.D., *Associate Professors of Chemistry*; JOSEPH S. ALPER, PH.D., ROBERT I. GELB, PH.D., JOSEPH E. KNOLL, PH.D., DANIEL A. LAUFER, PH.D., WALTER E. WEIBRECHT, PH.D., *Assistant Professors of Chemistry*; KENNETH CERNY, B.S., PAUL F. KEAVENEY, M.S., FREDERICK W. SNYDER, JR., B.S., *Lecturers in Chemistry*.

GRADUATION REQUIREMENTS

Chemistry majors will take a basic group of courses in chemistry, mathematics and physics which will satisfy usual requirements appropriate to preprofessional training in chemistry or teaching or to certain interdisciplinary fields of study.

All majors in chemistry are required to take Chemistry 103-04, 153-54, 213-14, 321, 370; Mathematics 105-06; and Physics 111-12. Students intending graduate study in chemistry should elect German or Russian to fulfill their language requirement and should take 4 courses among advanced chemistry courses, physics beyond 112, or mathematics beyond 106. Also, such students are strongly urged to take Thesis 397-98. Students with interest in the life sciences, including medicine, may select appropriate biology courses and/or biochemistry. Students interested in the teaching certification program should begin their teacher training courses in the junior year as part of their distribution options.

COURSE OFFERINGS

101 (I) CHEMICAL SCIENCE I

First semester of a one-year introductory course for non-science majors. The basic principles of atomic structure, molecular structure and chemical change. Topics include atomic theory, the periodic table, chemical bonding and thermochemistry. Laboratory work includes preparation and analysis of natural materials.

3 hours lecture, 1 hour recitation, 4 credits

Mr. Margulis, Mr. Weibrecht and Staff

102 (II) CHEMICAL SCIENCE (II)

Systematic descriptive chemistry and the chemistry of biological substances.

3 hours lecture, 1 hour recitation, 4 credits
Prerequisite: Chemistry 101

Mr. Margulis, Mr. Weibrecht and Staff

103 (I, II) CHEMICAL PRINCIPLES I

Introduction to the fundamental principles of chemistry including structure, the periodic table of the elements, chemical bonding and molecular structure, states of matter based on kinetic theory, chemical kinetics, equilibria, and elementary thermodynamics. Laboratory work an introduction to methods of quantitative chemical techniques.

2 hours lecture, 1 hour recitation,

3 hours laboratory, 4 credits

Mr. Knoll, Mr. Zompa and Staff

104 (II) CHEMICAL PRINCIPLES II

Introduction to electrochemistry, oxidation-reduction reactions, acid-base systems, and a survey of the chemical properties of elements based on principles already introduced. Laboratory work presents qualitative and quantitative analysis.

2 hours lecture, 1 hour recitation,

3 hours laboratory, 4 credits

Prerequisite: Chemistry 103

Mr. Knoll, Mr. Zompa and Staff

153 (I), 154 (II) ORGANIC CHEMISTRY

An intensive survey of the synthesis and properties of the main classes of organic compounds including mechanistic discussions of their reactions. Laboratory illustrates the preparation, purification and identification of organic compounds by classical experimental methods with an introduction to modern purification, analytical and instrumental techniques.

3 hours, 3 hours laboratory, 4 credits

Prerequisite: Chemistry 104 Mr. Wang

155 (I), 156 (II) INTRODUCTION TO ORGANIC CHEMISTRY

A survey of the synthesis and properties of the main classes of organic compounds including mechanistic discussions of their reactions. Special topics in natural products and processes Laboratory same as Chemistry 153-154. Primarily for Biology majors.

3 hours, 3 hours laboratory, 4 credits

Prerequisite: Chemistry 104 Mr. Becker

213 (I), 214 (II) PHYSICAL CHEMISTRY AND LAB

The fundamental theories and laws of physical chemistry. Topics include states of matter, thermodynamics, phase equilibria, the structure of matter, and chemical kinetics. Laboratory work illustrates lecture principles and provides practice in modern physical-chemical methods of experimentation.

3 hours, 3 hours laboratory, 4 credits
Prerequisite: Chemistry 104, Math 106, Physics 112; Chemistry 213 before 214

Mr. Schwartz

217 (I) PHYSICAL CHEMISTRY FOR BIOLOGY MAJORS

Principles of physical chemistry for advanced work in Biology and Biochemistry. Emphasis on equilibrium processes based on thermodynamic fundamentals and on the principles of rate processes.

3 hours, 3 credits

Prerequisite: Chemistry 104, Physics 102 or 112, Mathematics 105. NOTE: Credit cannot be received for both Chemistry 213-214 and Chemistry 217.

Staff

315 (II) TOPICS IN PHYSICAL CHEMISTRY

Topical discussions, each based on elementary principles studied in Chemistry 213-14 and progressing toward recent developments in the field.

3 hours, 3 credits

Prerequisite: Chemistry 214

Mr. Alper, Mr. Knoll,
Mr. Margulis, Mr. Schwartz

321 (I) ANALYTICAL CHEMISTRY

Detailed discussion of chemical equilibrium. Analytical applications of electrometric, chromatographic, and spectrometric methods.

2 hours, 6 hours laboratory, 4 credits

Prerequisite: Chemistry 104

Mr. Gelb

351 (I) ORGANIC QUALITATIVE ANALYSIS

Theory and practice in organic compound separation and identification employing classical and instrumental methods.

1 hour lecture, 6 hours laboratory, 3 credits

Prerequisite: Chemistry 154 or 156

Mr. Anselme

354 (II) INTRODUCTORY BIOCHEMISTRY

Structure, chemistry and metabolism of nucleic acids, proteins and carbohydrates.

3 hours, 3 credits

Prerequisite: Chemistry 154 or 156 or equivalent
Mr. Laufer

355 (I) TOPICS IN ORGANIC CHEMISTRY

Senior-level discussion of selected topics in organic chemistry.

3 hours, 3 credits

Prerequisite: Chemistry 154

Corequisite: Chemistry 351

Mr. Anselme, Mr. Becker, Mr. Laufer,
Mr. Wang

361 (I) ANALYTICAL INSTRUMENTATION

Principles and use of instrumental methods in analysis. Topics in electronics, electrochemistry, spectroscopy, flamephotometry, mass spectrometry, NMR.

3 hours, 3 hours laboratory, 4 credits

Prerequisite: Chemistry 214

Mr. Gelb

370 (II) INORGANIC CHEMISTRY

Discussion of the fundamental principles of modern inorganic chemistry. Laboratory includes synthetic techniques and methods of characterization of inorganic compounds.

2 hours, 6 hours laboratory, 4 credits

Prerequisite: Chemistry 104, 154, and either 213 or 217.

Mr. Weibrecht, Mr. Zompa

395 (I), 396 (II) ADVANCED LABORATORY IN CHEMISTRY

Special laboratory topics in chemistry.

12 hours laboratory, 4 credits

Prerequisite: Chemistry 214

Staff

397 (I), 398 (II) SENIOR THESIS IN CHEMISTRY

Original investigation by the student under the guidance of a faculty adviser. An oral resumé before the Chemistry staff is required.

12 hours laboratory, 4 credits

Prerequisite: Chemistry 214

Staff

PHYSICS

MARVIN M. ANTONOFF, Ph.D., *Associate Professor of Physics and Chairman of the Department*; DONALD H. LYONS, Ph.D., GEORGE SALZMAN, Ph.D., *Professors of Physics*; HAROLD P. MAHON, Ph.D., ARTHUR W. MARTIN, Ph.D., D.V.G.L.N. RAO, Ph.D., JOHN SHANE, Ph.D., *Associate Professors of Physics*; LEONARD A. CATZ, Ph.D., EDWARD S. GINSBERG,

PH.D., BENJAMIN R. MOLLOWS, PH.D., MARTIN POSNER, PH.D., NARESHCHANDRA SHAH, PH.D., *Assistant Professors of Physics*; PETER T. FARAGO, M.A., *Instructor in Physics*; DENNIS C. EHN, M.A., *Lecturer in Physics*.

GRADUATION REQUIREMENTS

Option A is intended primarily for students who plan to pursue graduate studies in a physical science; Option B is intended primarily for students who have broader interests (less physics specialization at the Bachelor degree level), e.g., for those who plan to teach in precollege programs. Election of Option B will not preclude a professional career in physics; however, a somewhat longer period of graduate study will normally be required than in the case of Option A.

Option A requires Physics 211, 212, 322, 350, 422, 4 credits of laboratory courses at the level of 281 or higher, of which 2 credits must be taken from 371, 381 or 382, and one elected course selected from those courses numbered 300 or higher; and one semester of an approved mathematics course beyond Mathematics 151. Students interested in this option are advised to begin their mathematics courses and preferably also physics in the freshman year.

Option B requires 32 credit hours in physics courses, including Physics 211, 212, 321, and 4 credits of laboratory courses at the level of 281 or higher, of which 2 credits must be taken from 371, 381 or 382 and Mathematics 150. The student may offer up to 9 credit hours in approved cognate courses in the natural sciences or mathematics in lieu of physics electives.

NOTE: Students who plan graduate work in physics are advised to acquire a facility in reading at least one of the following languages: French, German, or Russian.

COURSE OFFERINGS

Note: The Department of Physics offers three introductory level physics courses. Physics 101-02 is planned to be compre-

hensible to all students and is primarily intended for the non-science major. The Department recommends that physical science and mathematics majors enroll in Physics 111-12. Other science majors and students with a strong interest in science are advised to enroll in either Physics 103-04 or 111-12, dependent on their ability to meet the calculus corequisite for the Physics 111-12 sequence.

101 (I), 102 (II) CONCEPTS OF MODERN PHYSICS

Topics and problems of modern physics, with emphasis on the physical concepts, the experimental aspects, and their interrelation. Use of the historical approach to illustrate the role of the scientific method in the evolution of physical theories. Discussion of astrophysics, elementary particle physics, nuclear physics and solid state physics.

2 hours lecture, 2 hours recitation, 1 hour laboratory, 4 credits Mr. Salzman and Staff

103 (I), 104 (II) COLLEGE PHYSICS

Non-calculus introductory physics for the student with a strong interest or background in science. Topics in mechanics, wave motions, heat, kinetic theory of gases, electricity and magnetism, optics, atomic and nuclear physics.

2 lecture hours, 1 recitation hour, 2½ hours laboratory alternate weeks, 4 credits Staff

111 (I) FUNDAMENTALS OF PHYSICS I

The fundamental areas of physics covered in an integrated development of classical and modern concepts. Mathematical methods for the solution of problems. Subjects include mechanics, special relativity, thermodynamics, heat and kinetic theory.

3 hours lecture, 2 hours recitation, 2½ hours laboratory alternate weeks, 5 credits
Prerequisite or corequisite: Mathematics 105
Mr. Lyons and Staff

112 (II) FUNDAMENTALS OF PHYSICS II

Electricity, magnetism, and elementary wave motion, including topics in sound and light. Introduction to the quantum nature of light and wave aspects of particles.

3 hours lecture, 2 hours recitation, 2½ hours laboratory alternate weeks, 5 credits

Prerequisite: Physics 111
Prerequisite or corequisite: Mathematics 106
Mr. Lyons and Staff

121 (I), 122 (II) INTRODUCTION TO ASTRONOMY

Descriptive introduction to astronomy and astrophysics. Includes study of the planets, stars, galaxies, physics of space exploration and life on other worlds.

3 hours, 4 credits

Prerequisite: 2 semesters of physical science or permission of instructor Staff

211 (I) INTRODUCTION TO CONTEMPORARY PHYSICS

Wave motion; electromagnetism and light; atomic physics and elements of quantum mechanics; introduction to elementary particle physics, nuclear physics, and solid state physics.

3 hours, 3 credits

Prerequisite: Physics 112

Prerequisite or corequisite: Mathematics 150 or permission of instructor Mr. Shane

212 (II) MECHANICS

Principles of Newtonian mechanics, conservation laws, gravitational potential theory and conservative fields, central forces, oscillatory systems, rigid body rotation, and relativistic mechanics.

3 hours, 3 credits

Prerequisite: Physics 211 or permission of instructor; Mathematics 150 Mr. Shane

281(I), 282 (II) PHYSICAL LABORATORY

Basic principles of experimental physics and error analysis. Experiments in mechanics, heat, optics, electricity, magnetism, atomic and nuclear physics.

4 hours laboratory, 2 credits

Prerequisite: Physics 102 or 112, or permission of instructor Mr. Shah

321 (I) THEORY OF ELECTRICITY AND MAGNETISM (I)

Basic concepts of electric magnetic fields: electrostatics, magnetostatics, electric currents, electromagnetism; development of Maxwell's equations and simple applications, physical optics: reflection, dispersion, polarization and diffraction.

3 hours, 3 credits

Prerequisite: Mathematics 150

Prerequisite or corequisite: Physics 212 or permission of instructor Mr. Ginsberg

322 (II) THEORY OF ELECTRICITY AND MAGNETISM (II)

Description of the phenomena of electricity and magnetism in mathematical terms: boundary value problems and boundary conditions, transmission lines, wave guides,

radiation from a moving charge; special relativity.

3 hours, 3 credits

Prerequisite: Physics 321, Mathematics 151
Mr. Ginsberg

350 (I) STATISTICAL PHYSICS

Topics in heat, thermodynamics, kinetic theory and elementary statistical mechanics.

3 hours, 3 credits

Prerequisite: Physics 212 or permission of instructor Mr. Antonoff

361 (I) ELECTRONICS

The fundamentals of electronics, including d.c. and a.c. circuit analysis, vacuum tube circuits; transistors, amplifiers, oscillators and pulse and digital circuits.

3 hours, 3 credits

Prerequisite: Physics 112

Not offered 1970-71 Staff

371 (I) BASIC ELECTRONICS WITH LAB

Direct current circuits, electrical measurements, alternating current circuits, circuit analysis, diodes, rectifier circuits, filters, voltage regulators, vacuum tubes, transistors, amplifier circuits, oscillators, comparison measurements, elements of servo systems, operational amplifiers, pulse amplifiers—to be covered in lectures. In lab students perform a set of experiments simultaneously, so that basic concepts are easily grasped.

1 hour lecture, 4 hours laboratory, 3 credits

Note: Students may not be granted credit for both Physics 361 and 371.

Prerequisite: Physics 112 Mr. Rao

374 (II) SELECTED TOPICS IN ELECTRONICS

Concepts of digital measurements, counting, timing and switching, diode circuits, basic logic concepts, basic theorems in Boolean algebra, manipulation of logic statements, binary information gates, application of logic gates, flip-flops and multivibrators, counters, registers and readout, digital, analog-digital instruments and systems.

2 lecture hours, 2 credits

Prerequisite: Physics 371 Mr. Rao

381 (I), 382 (II) INTERMEDIATE LABORATORY

Experiments in geometrical and physical optics, electronics, atomic physics, nuclear physics. Individual program of experiments for each student according to his interests and previous experience.

4 hours laboratory, 2 credits

Prerequisite or corequisite: Physics 321
Not offered 1970-71 Mr. Posner

421 (I) ATOMIC PHYSICS AND INTRODUCTORY QUANTUM MECHANICS

The fundamental and elementary applications of quantum mechanics with emphasis on physical content rather than formalism. Elementary wave mechanics developed and applied to simple atomic structure. Topics include spectroscopic and other phenomena which form the experimental basis of modern atomic physics; the role of the Pauli principle and spin in determining periodic atomic properties; radiation phenomena.

3 hours, 3 credits

Prerequisite: Physics 212 or permission of instructor Staff

422 (II) NUCLEAR AND PARTICLE PHYSICS

The basic properties of nuclei, particle scattering, radioactivity, nuclear stability, dynamics of nuclear reactions, potential well and barrier problem in quantum mechanics, particles.

3 hours, 3 credits

Prerequisite: Physics 421 Staff

430 (II) INTRODUCTION TO SOLID STATE PHYSICS

An introductory treatment of the physics of solids.

3 hours, 3 credits

Prerequisite: Physics 350 and 421 Mr. Antonoff

481 (I), 482 (II) ADVANCED LABORATORY

Experimental work in a variety of fields selected to meet the needs of the student.

6 laboratory hours, 3 credits

Prerequisite: Physics 371 or 381 or 382 or permission of instructor

Mr. Mahon and Staff

PREMEDICAL PROGRAM

Students interested in a career in the medical profession should check Premedical Requirements under both Biology and Chemistry in the Division of Natural Sciences.

Students who demonstrate interest in and ability for a medical career should register with the Premedical Committee at the start of their third semester. The Committee will advise the student on matters concerning undergraduate curriculum, applications to dental, medical and veterinary schools, and will oversee

the evaluation of his record at the University of Massachusetts at Boston. Students should seek out information on graduate admission requirements as early as possible. Faculty advisers are Dr. Laufer, Department of Chemistry, and Dr. Schultz, Department of Biology.

Social Sciences

ECONOMICS

HARVEY H. SEGAL, PH.D., *Professor of Economics and Chairman of the Department*; HAROLD WOLOZIN, PH.D., *Professor of Economics*; LOUIS ESPOSITO, PH.D., MONIQUE P. GARRITY, PH.D., LEONARD J. KIRSCH, PH.D., SALVATORE SCHIAVO-CAMPO, M.A., DAVID PODOFF, PH.D., *Assistant Professors of Economics*; ANDREW HAMER, M.A., *Instructor in Economics*; S. CLARK GILMOUR, M.B.A., OTIS N. MINOT, PH.D., *Part-time Lecturers in Economics*.

GRADUATION REQUIREMENTS

All Economics majors are required to take Economics 141, 155, and 215-16. The normal major will be 24 credits of Junior-Senior level courses, although by permission of the Department up to 6 credits in related disciplines may be substituted for Economics courses.

Majors planning to go on to graduate study are advised to take Economics 251 and 252 and a Senior Seminar, which in some cases will be multi-disciplinary.

Pre-business Economics majors are required to take Mathematics 102, Economics 131, 155, 232, 263, and 304.

Seniors who have a cumulative average of at least 3.0 may be invited by the Department to participate in an Honor's Semester to count 3 credits toward the major.

COURSE OFFERINGS

131 (I, II) ACCOUNTING PRINCIPLES AND APPLICATIONS

A survey of the principles of accountancy with an emphasis on their practical applications.

3 hours, 4 credits

Mr. Gilmour

252 (II) ECONOMETRICS

Application of statistical methods to economic research. Emphasis on the traditional linear regression model and its extensions.

3 hours, 3 credits

Prerequisite: Economics 255 Staff

263 (I) INTRODUCTION TO DATA PROCESSING

A rigorous introduction to data processing emphasizing the mathematical and theoretical fundamentals of data processing, illustrated with examples drawn from current data processing projects. Stresses mathematical and logical concepts useful in the social sciences and management.

3 hours, 3 credits

Prerequisite: Mathematics 102 or equivalent
Mr. Minot

272 (II) COMPARATIVE ECONOMIC SYSTEMS

Relationship between market and non-market mechanisms in the production and distribution of economic resources in four economies. First half devoted to analysis of contemporary American capitalism, the British economy under Labor Government 1945-1950, and the German economy of 1934-1945. Second half concentrates on planned economy of the U.S.S.R.

3 hours, 3 credits

Prerequisite: Economics 141 Mr. Kirsch

291 (II) ECONOMICS OF LABOR AND COLLECTIVE BARGAINING

History of labor in the United States. The economic theory of wage determination and collective bargaining.

3 hours, 3 credits

Prerequisite: Economics 141 Mr. Kirsch

304 (II) FINANCIAL INSTITUTIONS

An intensive study of the structure and function of various institutions that comprise the United States financial system.

3 hours, 3 credits

Prerequisite: Economics 141 Staff

316 (I, II) MONETARY AND FISCAL POLICY

Analysis and evaluation of the tools of monetary and fiscal policy and their effectiveness in stabilizing economic activity.

3 hours, 3 credits

Prerequisite: Economics 215 Mr. Podoff

337 (I, II) THE TWENTIETH CENTURY ECONOMY

A survey of the principal American economic institutions and their historical roots, with

emphasis on national economic policy.

3 hours, 3 credits

Prerequisite: Economics 141 or permission of instructor
Mr. Segal

382 (I, II) SEMINAR

A Senior Seminar conducted by various members of the faculty with concentration on their fields of scholarly interest.

3 hours, 3 credits

Prerequisite: Permission of instructor
Mr. Wolozin and Staff

HISTORY

LOUIS RUCHAMES, Ph.D., *Professor of History and Chairman of the Department*;
PAUL F. BOLLER, Ph.D., FRANCIS L. BRODERICK, Ph.D., THOMAS N. BROWN, Ph.D., PAUL A. GAGNON, Ph.D., WALTER GROSSMANN, Ph.D., CARTER JEFFERSON, Ph.D., RICHARD H. POWERS, Ph.D., *Professors of History*; FERAZ AHMAD, Ph.D., WILLIAM A. PERCY, Ph.D., ROGER W. PROUTY, Ph.D., *Associate Professors of History*; VAN CLEAF BACHMAN, Ph.D., LESTER HUMPHREYS, Ph.D., ESTHER KINGSTON, Ph.D., PAULINE MAIER, Ph.D., JOAN T. MARK, Ph.D., WILLIAM MOFFETT, Ph.D., LESTER SEGAL, Ph.D., SUSAN SCHNEIDER, Ph.D., PETER WEILER, Ph.D., *Assistant Professors of History*; PAUL BOOKBINDER, M.A., CLARA ESTOW, M.A., CLIVE FOSS, M.A., RUTH LIEBOWITZ, M.A., TIMOTHY MCCARTHY, M.A., MORDECAI MELNITSKY, B.A., STANLEY REMSBERG, M.A., CARL SIRACUSA, M.A., MARTHA TOLPIN, M.A., *Instructors in History*.

GRADUATION REQUIREMENTS

History majors are required to take History 111-112, 125-126 in their Freshman and Sophomore years, and History 200 or 201 in their Junior year. Their major program must also include 3 hours of course work in Ancient, Medieval or the Early Modern period (before 1648), 6 hours in European history since 1815, and 12 hours from other courses offered in the Department. History majors will ordinarily be expected to fulfill the science requirement by taking Biology and Physics or Chemistry.

COURSE OFFERINGS

111 (I, II), 112 (I, II) MODERN WESTERN CIVILIZATION

The historical development of European civilization, ideas and institutions, including America's place in the Western world. Training in oral and written expression.

3 hours, 4 credits each semester Staff

125 (I), 126 (II) AMERICAN HISTORY

A survey of American history from 1763 to the present. The expansion and consolidation of the American Union, the development of national and international policies and the cultural and economic forces that shaped them.

3 hours, 4 credits

Prerequisite: History 111-12 Staff

200 (I, II) SEMINAR IN EUROPEAN HISTORY

A problems course intended to give training in historical research and writing. The field of study varies each semester.

3 hours, 3 credits

Prerequisite: History 111-12, 125-26 Staff

201 (I, II) SEMINAR IN AMERICAN HISTORY

Similar to History 200, but dealing with American history.

3 hours, 3 credits

Prerequisite: History 111-112, 125-126 Staff

203 (I), 204 (II) SPECIAL PROBLEMS

Guided reading and research; may be used in departmental Honors program.

3 hours, 3 credits

Prerequisite: Senior standing; History major Staff

205 (I) GREEK HISTORY

A survey of the origin, rise and development of ancient Greek civilization from the arrival of the Greeks in Europe until the death of Cleopatra. Emphasis on the rise of the Greek city-state and the spread of Greek culture to the East.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Foss

206 (II) ROMAN HISTORY

The Roman state from its origins until the triumph of Christianity. Republic and Empire will receive equal attention. Closely related to History 205; the two courses provide a continuous history of the Mediterranean world from about 700 B.C. to 300 A.D.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Foss

210 (I) EARLY MIDDLE AGES

Medieval history from Marcus Aurelius to approximately 1000 A.D.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Percy

211 (II) LATER MIDDLE AGES

Medieval history from 1000 A.D. to the Italian Renaissance.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Percy

215 (I) JEWISH HISTORY: ANTIQUITY TO THE LATE MIDDLE AGES

Survey of the political, social, and cultural history of the Jews from the origins of the Hebrew people to 1492. Attention to the Western and non-Western setting of Jewish society, and its interaction with ancient Near Eastern, Graeco-Roman, Muslim and Christian societies and cultures.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Segal

231 (I), 232 (II) ENGLISH HISTORY

An introduction to the constitutional, political, economic, social, religious and intellectual history of England, from the eve of the Norman Conquest to Restoration in the first semester, from the Restoration to the present in the second.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Moffett

233 (I) EARLY MODERN FRANCE: RENAISSANCE TO REVOLUTION

Social structure, political institutions and events, economic developments and intellectual movements from the late 15th century to the end of the Ancien Regime.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Segal

234 (II) FRANCE: 1815 TO THE PRESENT

The development of parliamentary institutions and crises in their social, economic and intellectual settings; France's role in the world.

3 hours, 3 credits

Prerequisite: Junior standing Staff

235 (I), 236 (II) RUSSIAN HISTORY

A survey of the political, economic, social and intellectual development of Russia, from Kiev to the emancipation of the serf (1861) in the first semester, through the Soviet Union in the Second World War in the second.

3 hours, 3 credits

Prerequisite: Junior standing Miss Kingston

237 (I) GERMAN HISTORY TO 1815
 Medieval origins of Germany, the Reformation, the rise of Brandenburg-Prussia, the German Enlightenment, Germany and the French Revolution.
 3 hours, 3 credits
 Prerequisite: Junior standing

Mr. Bookbinder

238 (II) GERMAN HISTORY
 SINCE 1815

German liberalism, nationalism, conservatism in 19th century, revolution of 1848, unification, World War I, Weimar, and the Nazi period.
 3 hours, 3 credits

Prerequisite: Junior standing

Mr. Bookbinder

239 (I), 240 (II) AGE OF THE
 RENAISSANCE AND REFORMATION

Men, ideas, and institutions of 14th through 16th century Europe.
 3 hours, 3 credits

Prerequisite: Junior standing

Mrs. Watkins

250 (I) AMERICAN COLONIAL
 HISTORY: THE EARLIEST
 SETTLEMENTS TO 1763

The English background of emigration and settlement. The evolution of imperial institutions, American social, economic, and religious development; emphasis on political ideas, institutions and behavior in the 17th and 18th centuries.
 3 hours, 3 credits

Prerequisite: Junior standing

Mrs. Maier

251 (II) THE AMERICAN
 REVOLUTIONARY ERA,
 1763-1789

The development of the conflict with Britain, 1763-1776; the Revolutionary War and its effects; the forming of republican institutions for state and Federal governments.
 3 hours, 3 credits

Prerequisite: Junior standing

Mrs. Maier

253 (I) THE AGE OF JACKSON
 AND LINCOLN

A social, economic, political and cultural history of the United States from 1815 to 1861.
 3 hours, 3 credits

Prerequisite: Junior standing

Mr. Ruchames

254 (II) CIVIL WAR AND
 RECONSTRUCTION HISTORY

Causes of the Civil War, its social, political, and ideological history, and the problems

and results of Southern reconstruction.
 3 hours, 3 credits

Prerequisite: History 125, 126, or Junior standing

Mr. Ruchames

255 (I) THE UNITED STATES IN
 THE TWENTIETH CENTURY,
 1900-1937

American politics and culture from the Progressive Period through the New Deal.
 3 hours, 3 credits

Prerequisite: History 126 or permission of instructor

Mr. Brown

256 (II) THE UNITED STATES IN
 THE TWENTIETH CENTURY,
 1937-1969

American politics and culture from the New Deal to the present.
 3 hours, 3 credits

Prerequisite: History 126 or permission of instructor

Mr. Brown

257 (I) AMERICAN SOCIAL HISTORY
 TO THE CIVIL WAR

The emergence of social institutions in America from the establishment of colonies to the mid-19th century.
 3 hours, 3 credits

Prerequisite: Junior standing

Staff

258 (II) AMERICAN SOCIAL HISTORY
 FROM THE CIVIL WAR TO THE
 PRESENT

The American Dream as it has related to institutions and ethnic groups in 20th century U.S.
 3 hours, 3 credits

Prerequisite: Junior standing

Staff

260 (I), 261 (II) HISTORY OF
 AMERICAN THOUGHT

Ideas in America—religious, scientific, political, social, and economic—from the colonial period to the Civil War in the first semester, and from the end of the Civil War to the New Deal in the second semester.
 3 hour, 3 credits

Prerequisite: Junior standing

Mr. Boller

264 (I) HISTORY OF AMERICAN
 FOREIGN POLICY, 1763-1900

Survey of the history of United States foreign policy and relations with the rest of the world, from the colonial period to the end of the 19th century; emphasis on domestic sources of foreign policy and U.S. expansionism.
 3 hours, 3 credits

Prerequisite: History 126 or Junior standing

Mr. Remsburg

265 (II) HISTORY OF AMERICAN FOREIGN POLICY, THE TWENTIETH CENTURY

Survey of the history of United States foreign policy and diplomatic relations with other powers from the turn of the century to the 1960s. Emphasis on domestic sources of foreign policies and on general topics such as World Wars I and II, Cold War diplomacy, and the debate over America's role in world affairs.

3 hours, 3 credits

Prerequisite: History 126 or Junior standing
Mr. Remsberg

266 (I) BLACK HISTORY IN AMERICA

Analysis of the history of Black people in America from African origins through the conclusion of Reconstruction in 1877. The development of slavery in the South and life in the cities of the North, particularly through reading in original accounts by Black Americans.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Stern

267 (II) BLACK HISTORY IN AMERICA

The experience of Black Americans from the rise of Jim Crow after 1877 through the emergence of the black challenge to American racial values and institutions in the 1950s and the 1960s.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Stern

308 (II) EUROPE DURING THE WARS OF RELIGION: 1555-1648

A survey of the Reformation and European politics and national development.

3 hours, 3 credits

Prerequisite: Junior standing
Mrs. Liebowitz

310 (I) EIGHTEENTH CENTURY EUROPE: EUROPE IN THE AGE OF ENLIGHTENMENT

The main currents of European thought in their historical setting.

3 hours, 3 credits

Prerequisite: Junior standing
Mr. Grossmann

318 (I) HISTORY OF EAST ASIA TO 1800

An introduction to the traditional civilizations of China and Japan from earliest times to the arrival of Western power.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Bix

319 (II) HISTORY OF EAST ASIA FROM 1800 TO THE PRESENT

The political, social, economic and intellectual problems resulting from the Western impact on China, and Japan, as well as Korea and Vietnam.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Bix

320 (I) CENTRAL EUROPE, 1815 TO THE PRESENT

The Habsburg monarchy and its successor states. Topics include the problems of a multinational area in an age of nationalism, the interaction between the Great Powers and the Danubian region, World War I and the fall of the Austro-Hungarian Empire, and the role of democracy, fascism and communism in Twentieth Century Central Europe.

3 hours, 3 credits

Prerequisite: Junior standing Staff

325 (I) THE MIDDLE EAST, 622-1517

Interaction between Islamic Society and the West from the rise of Islam (622) to the Turkish conquest of Egypt.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Ahmad

326 (II) THE MIDDLE EAST, 1517 TO THE PRESENT

The middle Eastern response to the West in the age of European expansion and domination.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Ahmad

329 (I), 330 (II) EUROPE IN THE TWENTIETH CENTURY

Political, economic, social and intellectual history of Europe, with attention to extra-European influences. From 1900 to 1939 in the first semester, 1939 to the present in the second.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Jefferson

339 (I) DIPLOMACY HISTORY OF EUROPE: 1815-1914

The diplomacy of the Concert of Europe, the Eastern Question and Bismarck and of imperialism leading to the outbreak of war in 1914.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Ahmad

340 (II) DIPLOMATIC HISTORY OF EUROPE: 1914 TO THE PRESENT

The system of collective security set up after World War I, and the failure of this system before the Second World War. Discussion of the origins and consequences of the Cold War.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Ahmad

345 (I) ECONOMIC HISTORY OF WESTERN EUROPE TO 1750

The economics of Western Europe from 500 to 1750.

3 hours, 3 credits

Prerequisite: History 111 Mr. Bachman

346 (II) ECONOMIC HISTORY OF WESTERN EUROPE, 1750 TO THE PRESENT

The economics of Western Europe from 1750 to the present.

3 hours, 3 credits

Prerequisite: History 111 Mr. Bachman

350 (I) BRITAIN IN THE TWENTIETH CENTURY

A survey of political and social change in Britain since 1900.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Weiler

355 (II) HISTORY OF SOCIALISM

An introduction to socialism as a critique of capitalism and as an alternative form of social-economic organization, through an intensive reading of the works of representative theorists of 19th century socialism, such as Saint-Simon and the Saint-Simonians, Fourier, Marx and Engels, Kropotkin, Bernstein, and Lenin. Attention to the historical conditions which influenced the development of socialist theory and which underlie the most significant conflicts and controversies in the history of the socialist movement.

3 hours, 3 credits

Prerequisite: Junior standing Mr. McCarthy

360 (I) COLONIAL LATIN AMERICA

The imposition of Spanish and Portuguese institutions on the pre-Columbian civilizations in the New World, and the economic, social, religious, political and cultural institutions that developed in Latin America. Emphasis on the differences and similarities between Colonial Latin America and other contemporary and later empires.

3 hours, 3 credits

Prerequisite: History 112 and 126 or permission of instructor Miss Schneider

361 (II) LATIN AMERICA: INDEPENDENCE TO THE PRESENT

The histories of Mexico, Argentina, Brazil and Cuba since 1800. Emphasis on British and American economic expansion into these countries during the 19th and 20th centuries, and the resulting political and social consequences.

3 hours, 3 credits

Prerequisite: Junior standing

Miss Schneider

375 (I) HISTORY OF AFRICA FROM 632 TO 1870

The impact of Islam on Africa, the Bantu migrations, the rise and fall of African kingdoms and city-states, the era of the slave trade, nineteenth century reformist movements in Eastern and Western Sudan, and interaction between traders, missionaries and African societies.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Amiji

376 (II) HISTORY OF AFRICA FROM 1870 TO THE PRESENT

The European conquest and partition of Africa, the establishment of European rule and African response to colonialism, forms of native administrative policies, socio-economic changes in African societies, growth of African nationalism, the emergence of independent African states and problems of decolonization.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Amiji

POLITICS

GEORGE GOODWIN, JR., PH.D., *Professor of Politics and Chairman of the Department*; GLENN E. TINDER, PH.D., *Professor of Politics*; RICHARD A. HOGARTY, PH.D., MAYNARD TOLL, PH.D., *Assistant Professors of Politics*; SANFORD B. GABIN, M.A., SANFORD LIEBERMAN, M.A., AARON SEIDMAN, M.A., ARTHUR P. SIMONDS, B.A., *Instructors in Politics*; BARNEY FRANK, B.A., HILARY B. NG'WENO, B.A., *Lecturers in Politics*.

GRADUATION REQUIREMENTS

Politics majors are required to take Politics 121 and 122 and eight courses above the introductory level. At least one upper level course should come from each of these

four fields: American Government and Politics, Comparative Government and Politics, International Relations, Political Theory. With the approval of a student's adviser, cognate courses may be substituted for two of the eight upper-class Politics courses.

COURSE OFFERINGS

121 (I, II) POLITICAL IDEAS OF THE TWENTIETH CENTURY

Major political viewpoints of the present time, including conservatism, liberalism, marxism and fascism. Authors read and discussed include men such as Buber, Fanon, Freud and Marcuse.

3 hours, 4 credits Staff

122 (II) GOVERNMENT AND POLITICS OF THE UNITED STATES

The three main branches of the national government, federalism, political parties and interest groups, and governmental functions.

3 hours, 4 credits Staff

201 (I) POLITICAL PARTIES

The American political process, with emphasis on political parties, pressure groups and public opinion.

3 hours, 3 credits
Prerequisite: Junior standing Mr. Goodwin

212 (II) THE LEGISLATIVE PROCESS

The functions of national and state legislatures, and the role played by political parties and interest groups in the legislative process.

3 hours, 3 credits
Prerequisite: Junior standing Mr. Goodwin

223 (I) PUBLIC ADMINISTRATION

The bureaucratic process, emphasizing organizational behavior, changes in administrative institutions and theories, and the political role of bureaucracy.

3 hours, 3 credits
Prerequisite: Junior standing Mr. Hogarty

231 (I) AMERICAN CONSTITUTIONAL LAW AND THEORY

The development of the United States Constitution, chiefly through decisions of the Supreme Court. Emphasis on the origin and nature of judicial power, the way it inhibits and facilitates operation of the political process, and the search for standards by which to judge the judges.

3 hours, 3 credits
Prerequisite: Junior standing Mr. Gabin

241 (I) METROPOLITAN POLITICS

Municipal politics, organization and functions; special reference to impact of recent social and economic changes upon city, suburban and intergovernmental politics in metropolitan regions.

3 hours, 3 credits
Prerequisite: Junior standing Staff

244 (II) THE FEDERAL SYSTEM

Consequences of areal division of power for politics at national, state and local levels.

3 hours, 3 credits
Prerequisite: Junior standing Staff

245 (II) STATE AND LOCAL POLITICS

The dynamics and interrelationships of state and local governmental units, emphasizing leadership resources and political change.

3 hours, 3 credits
Prerequisite: Junior standing Mr. Hogarty

251 (I), 252 (II) EUROPEAN COMPARATIVE GOVERNMENT

Problems in the government and politics of selected European countries.

3 hours, 3 credits
Prerequisite: Junior standing Mr. Simonds

253 (II) GOVERNMENT AND POLITICS OF BRITAIN

Political institutions as they exist in the land of 'ultrastability,' social accommodation and circulatory elitism. Comparisons with institutions in other Western democracies.

3 hours, 3 credits
Prerequisite: Junior standing Mr. Beichman

254 (II) GOVERNMENT AND POLITICS OF THE SOVIET UNION

The historical and ideological origins of the Soviet Union; the role and beliefs of the Communist party under Lenin and Stalin and in the post-Stalin period; contemporary Soviet ideology and Western theories of totalitarianism.

3 hours, 3 credits
Prerequisite: Junior standing Mr. Lieberman

257 (I), 258 (II) GOVERNMENT AND POLITICS OF AFRICA

African government and politics with emphasis on stability in African political systems and on the role of tribes, political parties, armies, and government bureaucracies.

3 hours, 3 credits
Prerequisite: Junior standing Staff

261 (I) THE POLITICS OF
NATIONAL DEVELOPMENT

An examination of the extent to which elements of the 'third world' have progressed from statehood to nationhood during the quarter century following the great anti-colonial revolution.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Beichman

264 (II) CHINA IN THE
MODERN WORLD

The attempts of three Chinese regimes—the Traditional, the Nationalist, and the Communist—to cope with the domestic and international problems created by China's emergence as a nation state.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Landry

301 (I) INTERNATIONAL
RELATIONS

The nation-state system and conceptions of national interest in modern world politics; forms and distribution of power; the making of foreign policy and adjusting international conflict.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Toll

304 (II) AMERICAN FOREIGN
POLICY

Major issues and problems of American foreign policy in the contemporary world.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Toll

351 (I) ANCIENT AND MEDIEVAL
POLITICAL THOUGHT

The origins and the early development of the main political ideas of the West.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Tinder

352 (II) MODERN POLITICAL
THOUGHT

The history of Western political ideas from the time of Machiavelli to that of Marx.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Tinder

356 (II) AMERICAN POLITICAL
THOUGHT

An analytical and historical study of the development of American political thought and institutions from colonial times. Primary source readings feature the ideas and deeds of those who have shaped the American concept of free government.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Gabin

362 (II) SOCIALISM IN THE
MODERN WORLD

The origins and doctrines of modern socialism with particular emphasis on Marxist-Leninist thought. Topics include: Utopian and Guild Socialism, Fabianism, Syndicalism, Titoism, Marxist Revisionism, Maoism and Socialism in the United States.

3 hours, 3 credits

Prerequisite: Junior standing

Mr. Lieberman

371 (I) HISTORY OF CHINESE
POLITICAL THOUGHT

The origins and continuity of Chinese political thought and its radical transformation in the 20th century.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Landry

391 (I), 392 (II) SEMINAR

Intensive studies in various important fields in politics. Emphasis placed on independent research.

3 hours, 3 credits

By invitation of department

Staff

393 (I), 394 (II) SPECIAL PROBLEMS

Guided reading in special areas of Politics. May be used for Honors thesis.

3 hours, 3 credits

By invitation of department

Staff

395 (I), 396 (II) SPECIAL PROBLEMS
IN THE FIELD OF POLITICS

Special-topic seminars given by visiting instructors to enrich the Politics course offerings.

3 hours, 3 credits

Prerequisite: permission of department

PSYCHOLOGY

DONALD KRUS, Ph.D., *Professor of Psychology and Chairman of the Department*; DAVID MORIARTY, M.D., BERNARD ROSENBLATT, Ph.D., *Professors of Psychology*; MAXWELL J. SCHLEIFER, Ph.D., *Associate Professor of Psychology*; SEYMOUR FRIEDLAND, Ph.D., SUZANNE GASSNER, Ph.D., DAVID HUNT, Ph.D., PAUL KANZER, Ph.D., STANLEY D. KLEIN, Ph.D., THOMAS KREILKAMP, Ph.D., JONATHAN SLAVIN, Ph.D., BURTON WEISS, Ph.D., *Assistant Professors of Psychology*; BRUCE C. BLANEY, M.A., DAVID EDELSTEIN, M.A., BARBARA ROSS, M.A., RICHARD ST. JEAN, B.A., *Instructors in Psychology*;

KALMAR HELLER, PH.D., *Lecturer in Psychology*; SANFORD AUTOR, PH.D., SUSAN MONJAN, PH.D., SEBASTION SANTOSTEPHANO, PH.D., *Visiting Lecturers in Psychology*.

GRADUATION REQUIREMENTS

Psychology majors must take Psychology 122 plus eight advanced courses, including Psychology 235. Majors who intend to apply to graduate departments of Psychology are strongly advised to take Psychology 271. Students who wish to take an advanced course before their Junior year must have permission of the instructor.

COURSE OFFERINGS

122 (I, II) INTRODUCTION TO PSYCHOLOGY: PSYCHOANALYSIS AND THE STUDY OF MAN

Basic psychoanalytic concepts applied to the study of man.

3 hours, 4 credits

Prerequisite: Sophomore standing Staff

235 (I, II) SYSTEMS OF PSYCHOLOGY

Major trends in contemporary psychology, based on historical evaluation of the leading concepts.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Schleifer

237 (I, II) DEVELOPMENTAL PSYCHOLOGY

Normal and abnormal development of mind and personality, with special emphasis on infancy, childhood and adolescence.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Klein

238 (I) ADVANCED DEVELOPMENTAL PSYCHOLOGY: SPECIAL TOPICS IN DEVELOPMENTAL PSYCHOLOGY

The theoretical frontiers in clinical child psychology, from a developmental approach.

3 hours, 3 credits

Prerequisite: permission of instructor Staff

239 (I, II) EDUCATIONAL PSYCHOLOGY

Application of psychological concepts to education with emphasis on the role of the school, the family, the classroom and the teacher in the educational process.

3 hours, 3 credits

Prerequisite: Junior standing Staff

240 (I, II) PSYCHOPATHOLOGY

Study of etiology, dynamics and treatment of psychopathology.

3 hours, 3 credits

Prerequisite: Junior standing Staff

250 (I, II) THEORIES AND FUNDAMENTAL ISSUES OF LEARNING

Review of such basic learning theories as those of Pavlov, Hull, Tolman, and Kohlet, and an attempt to apply theory to selected topics.

3 hours, 3 credits

Prerequisite: Junior standing Staff

260 (I, II) THEORIES OF PERSONALITY

A comprehensive history and study of major personality theories.

3 hours, 3 credits

Prerequisite: Junior standing Mr. Schleifer

270 (I, II) SOCIAL PSYCHOLOGY

A basic survey of social psychology, with focus on the nature of human groups and the way man's participation in them affects his own behavior.

3 hours, 3 credits

Prerequisite: Psychology 122 and Junior standing Staff

271 (I, II) EXPERIMENTAL METHOD IN PSYCHOLOGY

The historical foundations and development of psychology as a science with focus on the nature of scientific method in general, and experimental method in particular.

3 hours, 3 credits

Prerequisite: Psychology 122; majors only or permission of instructor Staff

272 (I, II) PSYCHOLOGY OF PERCEPTION

The traditional problems of perception, with focus on the changing theoretical perspectives within which these problems are viewed. Evolution in theory from early elementalistic approaches to the more current concern with perception-personality relationships.

3 hours, 3 credits

Prerequisite: Psychology 122 and Junior standing Mr. Krus

273 (I, II) PHYSIOLOGICAL PSYCHOLOGY

A basic survey of physiological psychology: sensory processes, motor behavior, drives and instincts, arousal and learning.

3 hours, 3 credits

Prerequisite: Psychology 122 Mr. Weiss

275 (I, II) THINKING AND DISORDERS OF THOUGHT

The nature of the thought process; theories of thinking; contributions of psychopathology to an understanding of thinking.

3 hours, 3 credits

Prerequisite: Psychology 122 and Junior standing
Mr. Moriarty

277 (I, II) COMPARATIVE PSYCHOLOGY

Evolution of behavior, similarities and differences in capacities for environmental adjustment and for behavioral organization among the important types of living beings, from plants and unicellular organisms to the primates, including man.

3 hours, 3 credits

Staff

280 (I, II) HISTORY OF PSYCHOLOGY

Psychological concepts from Aristotle to Freud; a consideration of the classic doctrines of man, the views of the 17th century philosophers, the Darwinian influence and a preview of 19th century developments.

3 hours, 3 credits

Staff

295 (I), 296 (II) PROBLEMS IN PSYCHOLOGY

Independent work on special problems or in certain fields of psychological interest by arrangement with department.

3 credits

Staff

SOCIOLOGY AND ANTHROPOLOGY

RICHARD H. ROBBINS, Ph.D., Professor of Sociology and Chairman of the Department; GORDON C. ZAHN, Ph.D., Professor of Sociology; HARRY BRILL, Ph.D., BARBARA CHASIN, Ph.D., JOHN K. DICKINSON, Ph.D., PEGGY COOK MARQUIS, Ph.D., Assistant Professors of Sociology; JUAN E. CORRADI, M.A., PAUL DEVORE, M.A., Instructors in Sociology; LUCILLE KAPLAN, M.A., Part-time Instructor in Anthropology; BARBARA AYRES, Ph.D., Lecturer in Anthropology; JOAN HARRIS, Ph.D., Part-time Lecturer in Sociology.

GRADUATION REQUIREMENTS

The Department of Sociology and Anthropology offers a major in Sociology as well as a concentration in Anthropology for a limited number of students. Majors should take introductory courses in Psy-

chology and Sociology during the Sophomore year and a minimum of eight additional courses in the Junior and Senior years. Within the major, the Department requires one course in Anthropology, Sociology 356, and Sociology 382 (to be taken during the Senior year). At the invitation of the Department, a Senior may take individual directed study with an emphasis on independent research. Majors are encouraged to choose related subjects within the Division of Social Sciences. The Department permits up to two cognate courses from other social sciences to be counted toward the major. A list of these courses can be consulted at the Departmental Office.

COURSE OFFERINGS

SOCIOLOGY 121 (I, II)

INTRODUCTION TO SOCIOLOGY

The structure of society, cultural patterns, and group life. The individual and socialization, groups, institutions, social systems, social change.

3 hours, 4 credits

Staff

ANTHROPOLOGY 122 (I, II)

INTRODUCTION TO ANTHROPOLOGY

A general introduction to social anthropology, with emphasis on comparative analysis of non-Western peoples, their cultures and social structures, ethnological generalizations from reading on primitive and peasant societies.

3 hours, 4 credits

Staff

SOCIOLOGY 221 (II) THE URBAN COMMUNITY

The development of the city as a complex form of the human community. History and growth of urbanism in industrial societies and developing nations. Urban change and the problem of planning.

3 hours, 3 credits

Prerequisite: Sociology 121 and Psychology 122
Mr. Brill

ANTHROPOLOGY 225 (II) MAN IN PREHISTORY

Human evolution and man's early cultural development. Integrates traditional physical anthropology and prehistoric archeology. Emergence of hominids and living races of men; analysis of cultural growth in New and Old Worlds.

3 hours, 3 credits

Prerequisite: Sociology 121 or Anthropology 122
Mrs. Kaplan

ANTHROPOLOGY 236 (I)**COMPARATIVE ETHNOLOGY**

The wide range of cultural variation to be found in different world regions. Intensive comparative analysis of representative cultures and social structures.

3 hours, 3 credits

Prerequisite: Sociology 121 or Anthropology 122

Mrs. Ayres

SOCIOLOGY 252 (I) RACIAL**AND ETHNIC RELATIONS**

Conflicts and accommodations among differing racial and ethnic groups. Nature and character of prejudice and discrimination. Minority-majority relations in selected societies.

3 hours, 3 credits

Prerequisite: Sociology 121

Staff

SOCIOLOGY 253 (II) POPULATION AND ECOLOGY

The population explosion, birth, death and illness. Immigration and emigration. How the human and physical environment interacts with features of population.

3 hours, 3 credits

Prerequisite: Sociology 121

Mr. Dickinson

SOCIOLOGY 262 (II)**POLITICAL SOCIOLOGY**

An interdisciplinary study with stress on the nature of power and its distribution in society. Alternative approaches to changing and transforming power structures.

3 hours, 3 credits

Prerequisite: Sociology 121 and Politics 121

Staff

ANTHROPOLOGY 268 (I) PEOPLES AND CULTURES OF MESO-AMERICA

Focus on social change in modern Meso-America; the modernization process and its relation to rural society; urbanization and the development of contemporary elites.

3 hours, 3 credits

Prerequisite: Sociology 121 or Anthropology 122

Staff

PSYCHOLOGY 270 (I, II) SOCIAL PSYCHOLOGY

Can be credited toward Sociology major. See Psychology Department for description and prerequisite.

SOCIOLOGY 274 (I) SOCIAL DEVIANCE AND CONTROL

The social conditions of individual and group behavior disorders; deviant subcultures and social control.

3 hours, 3 credits

Prerequisite: Sociology 121

Mrs. Marquis

SOCIOLOGY 275 (I) SOCIETY AND THE INDIVIDUAL

Basic survey of the impact of social environment on the behavior, attitudes and personality of individuals. Theoretical and research literature bearing on the concept of socialization as a continuous process through the life cycle, with emphasis on the implications for personal and social change.

3 hours, 3 credits

Prerequisite: Sociology 121, Psychology 122

Mrs. Marquis

SOCIOLOGY 316 (I) SOCIAL CHANGE AND MODERNIZATION

Social and economic aspects of development and modernization in various societies. Special emphasis on Latin America.

3 hours, 3 credits

Prerequisite: Sociology 121 and/or Anthropology 122

Mr. Corradi

SOCIOLOGY 327 (I) SOCIAL STRATIFICATION

Social classes in traditional and industrial societies. Classes, castes and mobility. Theories of class relationships, conflicts. Marxist and other ideologies.

3 hours, 3 credits

Prerequisite: Sociology 121 and Psychology 122

Mrs. Chasin

SOCIOLOGY 339 (II) SOCIOLOGY OF RELIGION

Belief systems and social structures of religious groups. Impact of religious systems on familial, economic, political and other institutions.

3 hours, 3 credits

Prerequisite: permission of instructor

Mr. Zahn

SOCIOLOGY 356 (I, II) METHODS OF SOCIOLOGICAL RESEARCH

Design of sociological research and methods of inquiry. Organization and analysis of data. Development of research projects.

3 hours, 3 credits

Prerequisite: Junior standing

Mr. Dickinson, Mrs. Marquis

SOCIOLOGY 382 (I, II) ELEMENTS OF SOCIOLOGICAL THEORY

Reading and discussion of basic sociological works in theory. Relevance of earlier and contemporary theory to contemporary sociological interests and research.

3 hours, 3 credits

Prerequisite: Sociology 121

Mr. Zahn, Mr. Corradi

SOCIOLOGY 389 (I, II) SPECIAL TOPICS SEMINAR

Intensive study of special topics varying each year according to instructor.

3 hours, 3 credits

Prerequisite: Sociology 121 and permission of instructor Mr. Zahn

ANTHROPOLOGY 389 (I, II) SPECIAL TOPICS SEMINAR

Intensive study of special topics varying each year according to instructor.

3 hours, 3 credits

Prerequisite: Sociology 121 and permission of instructor Mr. Zahn

ANTHROPOLOGY 391 (II) ANTHROPOLOGICAL THEORY

Survey of the major theoretical positions in social and cultural anthropology with special reference to contemporary approaches to problems of structure, function and process. Reading and analysis of major theoretical works by European and American Anthropologists.

3 hours, 3 credits

Prerequisite: Anthropology 122 Staff

SOCIOLOGY 399(I, II) DIRECTED STUDY IN SOCIOLOGY

Students may be invited by the Department to conduct independent research during the Senior year. Periodic consultation and guidance provided by the staff.

Hours by appointment; 3 credits

Prerequisite: Sociology 121 and Psychology 122 Staff

ANTHROPOLOGY 399 (I, II) DIRECTED STUDY IN ANTHROPOLOGY

Students may be invited by the Department to conduct independent research during the Senior year. Periodic consultation and guidance provided by the staff.

Hours by appointment; 3 credits

Prerequisite: Sociology 121 and Psychology 122 Staff

DIVISIONAL COURSE IN SOCIAL SCIENCES

SOCIAL SCIENCES 386 (I, II) LEARNING AND TEACHING OF SECONDARY SCHOOL SOCIAL SCIENCES

The issues, principles, and methods of secondary school social science teaching; supervision and critique of practice teaching.

3 hours, 20 hours laboratory (practice teach-

ing), 9 credits

Prerequisite: 6 hours Education courses and admission to Teacher Certification Program Mrs. Mark

Afro-American Studies Concentration

This special program, derived from the University's commitment to offer courses in both Western and non-Western studies, is specifically designed for students interested in the historical experience, cultural accomplishments, and significant presence of the Black man in Africa and the New World. Successful completion of the Concentration will be formally acknowledged on students' official records.

Students must major in a department and will be trained in its discipline while electing courses which emphasize Afro-American subject matter. Faculty advisers, and members of the Afro-American Studies Concentration Committee, will assist students in choosing these courses.

Option A: A minimum of six courses from the Approved List.

At least three of these courses must be taken outside the major department.

Option B: *Honors Program*. A Junior/Senior year honors program for highly qualified students who present to the Afro-American Studies Concentration Committee a satisfactory proposal for in-depth study of an appropriate subject or problem. Requires two semesters of an interdisciplinary Junior seminar (Afro-American Studies 390-391), the election of at least two additional courses as appropriate and the writing of an honors thesis during the Senior year which is acceptable to the Committee.

COURSE OFFERINGS

AFRO-AMERICAN STUDIES

390 (I), 391 (II) AFRO-AMERICAN STUDIES HONORS SEMINAR

An interdisciplinary seminar for students admitted to Option B (Honors), and to a limited number of other highly qualified students participating in the Option A program.

3 hours, 3 credits

Prerequisite: 3.0 overall average and permission of the Afro-American Studies Concentration Committee Staff

AFRO-AMERICAN STUDIES

398 (I), 399 (II) AFRO-AMERICAN STUDIES SENIOR HONORS THESIS

Study in depth of a topic chosen by the student in consultation with an honors adviser, and a paper written with the approval and under the direction of an honors adviser, normally related to work done in the Honors Seminar. Honors will be awarded on the basis of performance in the Honors Seminar, evaluation of the paper by the Afro-American Studies Concentration Committee, and 3.0 overall average.

3 hours, 3 credits

Prerequisite: Afro-American Studies 390 and 391, and permission of the Afro-American Studies Concentration Committee
Not offered 1970-1971

ADDITIONAL APPROVED COURSE OFFERINGS

(See Department listings for complete course descriptions. Students may petition the Afro-American Studies Concentration Committee for permission to include other relevant courses in their Concentration program. In addition a list of Inter-Institutional Black Studies courses is available from the Registrar. These courses will also be credited toward the Concentration.

Anthropology 122	Staff
Introduction to Anthropology	
Anthropology 258	Mr. Nketsia
People and Cultures of Africa	
Art 227	Mr. McCall
The Art of Africa	
Economics 213	Staff
Urban Problems	
Economics 243	Staff
Economic Problems and Prospects of Black America	

English 358	Mr. Senna
Black Literature in America	
English 381	Mr. Gittleman
Selected Topics: Black and White on Black	
French 263	Mr. Sarotte
The Black Soul and the Theatre	
French 358	Mr. Sarotte
Roman et poésie noire française	
History 201	Mr. Ruchames
Research and Methods: The Anti-Slavery Movement	
History 253	Mr. Ruchames
The Age of Jackson and Lincoln	
History 254	Mr. Ruchames
Civil War and Reconstruction	
History 266	Mr. Stern
Black History in America	
History 375-376	Mr. Amiji
History of Africa	
Humanities 249	Mr. Armah
African Literature	
Music 251	Mr. Huggler
Jazz	
Music 252	Mr. Huggler
Non-Jazz Black Music in America	
Politics 205	Mr. Williams
Afro-American Experience	
Politics 257-258	Mr. Nketsia
Politics of Africa	
Politics 261	Mr. Beichman
National Development	
Sociology 221	Mr. Brill
Urban Community	
Sociology 252	Mr. Blackwell
Racial and Ethnic Relations	
	Mr. Robbins
Sociology 316	Mr. Corradi
Social Change and Modernization	
Spanish 232	Mrs. Osorio
Introduction to Latin-American Culture	

Teacher Certification Program

Students seeking careers in education may avail themselves of the services of the Teacher Certification Program. The staff provides information and counseling to all students interested in preparing to teach. In addition, the program enables highly qualified students who have demonstrated a potential for leadership in the schools to satisfy Massachusetts requirements for

certification. Since the University at Boston offers no major in Education, a teaching candidate pursues the University's normal degree and major sequences. At the same time, by judicious choice of electives from among those offered by several departments, he may acquire credits in courses approved for certification. The program culminates in the Senior year when, under the direction of the faculty of his major department, the student enters practice teaching and participates concurrently in a curriculum-and-methods seminar.

REQUIREMENTS FOR CERTIFICATION

The Commonwealth of Massachusetts issues teaching certificates to American citizens who hold the bachelor's degree and who comply with certain additional requirements. Briefly summarized, those requirements are, for elementary teaching, 18 credits in approved courses; for secondary teaching, 12 credits in approved courses, plus concentration in a subject taught in the secondary school. Approved courses must include at least two of the following four subjects: Psychology of Education, Philosophy of Education, Curriculum, Methods of Instruction. Supervised teaching experience is also necessary for both the elementary and the secondary certificate.

ADMISSION TO THE TEACHER CERTIFICATION PROGRAM

With the exception of the Senior curriculum-and-methods seminar and concurrent practice teaching, all courses leading to certification are open to every student. Admission to the Senior year program requires a cumulative average of at least 3.0 by the end of the Junior year, as well as the approval of the student's major department and of the Coordinator of the TCP. A student who by reason of special circumstances can satisfy only two of these three criteria may appeal for favorable consideration on one of several grounds: (1) he has distinguished himself in his major field, although not in other sub-

jects; (2) he has distinguished himself in recent semesters; or (3) he can show evidence of unusual talent for, or interest in, work with children. Appeals are referred to a Faculty Committee which includes the Coordinator of the TCP, and which may also include a faculty advocate designated by the appellant.

APPLICATION PROCEDURE

Because preparation for teaching makes demands beyond those ordinarily required to earn a degree, the prospective candidate must begin to plan early. He should register with the Teacher Certification Program before the middle of his Sophomore year, and should seek assistance in planning his future program from the TCP Coordinator and from a member of his major department. He may want to consider attending at least one Summer Session in order to relieve the pressures of the Senior year, when practice teaching will claim a large share of his time and energy.

Those who wish to enroll in the curriculum-and-methods/practice teaching sequence must apply for admission before February 15 of the Junior year. Application forms are available in the TCP office.

COURSES APPROVED FOR CERTIFICATION

The following courses may be counted toward fulfillment of Massachusetts certification requirements. Starred courses are especially recommended.

Economics 141	Economic Literacy: Economics for Citizenship
English 252	Advanced Composition
English 374	Principles and Methods of Literary Criticism
English 375	History of the English Language
French 362	L'Education vue par les Ecrivains Français
History 200	Seminar in European History
History 201	Seminar in American History

History 258	American Social History from the Civil War to the Present	Art 392	Learning and Teaching of Art in the Schools
*Philosophy 281	Philosophy of Education	Classics 386	Learning and Teaching of Secondary School Latin
Psychology 237	Developmental Psychology	Biology 386	Learning and Teaching of Biology
*Psychology 239	Educational Psychology	English 386	Learning and Teaching of Secondary School English
Psychology 250	Theories and Fundamen- tal Issues of Learning	French 386	Learning and Teaching of Secondary School French
The electives below are open only to Seniors who have completed two or more certification courses and who have been admitted to the Teacher Certification Pro- gram. All include full days of practice teaching, five days a week, for a period of 10 weeks, under the supervision of experi- enced teachers and University faculty. Students will find it mandatory to carry a reduced course load during the semester of practice teaching.		German 386	Learning and Teaching of Secondary School German
Each of the courses listed below is a 9-credit block. Each department deter- mines the amount of credit (if any) granted toward the major. Students are advised to consult their major department concerning distribution of credit and scheduling of practice teaching.		Mathematics 386	Learning and Teaching of Secondary School Mathematics
		Social Sciences 386	Learning and Teaching of Secondary School Social Studies
		Spanish 386	Learning and Teaching of Secondary School Spanish
		TCP 390	Seminar in Elementary School Curriculum and Methods of Teaching

Faculty of Resident Instruction

1969-1970

ROSE ARENDSTERN, B.A. (Hunter College), M.A., Ph.D., (Bryn Mawr College), *Assistant Professor of French.*

FEROZ AHMAD, B.A. (St. Stephen's College, Delhi University), M.A., Ph.D. (London University), *Associate Professor of History.*

NADYA AISENBERG, B.A. (Bennington College), M.A. (University of Wisconsin), *Part-time Lecturer in English.*

MARY LEE ALLEN, B.A. (Wellesley College), M.A. (University of Michigan), (Stanford University), *Assistant Professor of English.*

LUIS RICARDO ALONSO, Doctor in Ciencias Sociales (Havana University), *Associate Professor of Spanish.*

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VAN CLEAF BACHMAN, B.A. (Princeton University), Ph.D., (John Hopkins University), *Assistant Professor of History.*

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ROSEMARY BARTON, B.A. (Smith College), M.A.T. (Harvard University), M.A. (Tufts University), *Instructor in Classics.*

ADRIANNE BAYTOP, B.A. (Howard University), M.A., Ph.D. (University of Massachusetts), *Assistant Professor of English.*

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RUTH R. BENNETT, B.S., Ph.D. (Tufts University), *Assistant Professor of Biology.*

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BRUCE C. BLANEY, B.A. (Clark University), M.A. (Harvard University) *Instructor in Psychology.*

MAX BLUESTONE, B.N.S. (The College of the Holy Cross), M.A., Ph.D. (Harvard University), *Associate Professor of English.*

ANDREW BOELCSKEVY, B.A. (West Virginia University), M.A., Ph.D. (University of Pennsylvania), *Assistant Professor of German.*

VORSILA BOHRER, B.A. (University of Arizona), M.S. (University of Michigan), Ph.D. (University of Arizona), *Lecturer in Biology.*

PAUL F. BOLLER, B.A. (Yale College), Ph.D. (Yale University) *Professor of History.*

PAUL BOOKBINDER, B.A. (Queens College), M.A., Ph.D. (Northeastern University), *Assistant Professor of History.*

CHARLES BOWEN, B.A. (University of Notre Dame), M.A. (Yale University), *Instructor in English.*

STUART W. BRADFORD, B.S., M.S. (Michigan State University), Ph.D. (Washington University, St. Louis), *Assistant Professor of Biology*.

PATRICIA BRENNAN, B.S. (Tufts University), M.S. (Georgetown University), *Lecturer in Biology*.

HARRY BRILL, B.A. (Brooklyn College), M.A., Ph.D., (University of California, Berkeley), *Assistant Professor of Sociology*.

FRANCIS L. BRODERICK, B.A. (Princeton University), M.A., Ph.D., (Harvard University), *Professor of History*.

JAMES H. BRODERICK, B.A. (Harvard College), M.A. (University of Chicago), Ph.D. (Harvard University), *Associate Professor of English*.

HAROLD BRONK, B.A. (Hofstra College), S.T.B. (Berkeley Divinity School), *Instructor in Philosophy*.

LUISE BRONNER, B.S. (University of Rhode Island), M.A., Ph.D. (University of Massachusetts), *Assistant Professor of German*.

N. SANDRA BROWN, B.A., M.Ed. M.A. (Boston University), *Instructor in Biology*.

THOMAS N. BROWN, B.S. (Boston College), M.A., Ph.D. (Harvard University), *Professor of History*.

IVONNE BUCK, B.A. (Instituto Del Profeso Ra. Do Secundario Jose Herandez), M.Ed. (Harvard Graduate School of Education), *Lecturer in Spanish*.

SUSAN BUSH, B.A., M.A. Ph.D. (Harvard University), *Part-time Lecturer in Art*.

FREDERICK BUSI, B.A. (American International College), M.A., Ph.D. (University of Connecticut), *Associate Professor of French*.

DAVID BUSKEY, B.A. (University of Massachusetts), *Lecturer in French*.

JAMES S. BYRNES, B.A. (New York University), M.A., Ph.D. (Yeshiva University), *Assistant Professor of Mathematics*.

CHARLES CAMPBELL, B.A. (University of Massachusetts), M.A. (University of Chicago), Ph.D. (University of Minnesota), *Associate Professor of English*.

ANTONIO F. CARRARA, B.A., M.A. (Boston College), *Instructor in Italian*.

NOEL CARRERE, B.S. (Ecole Nationale des Ponts et Chavssces), *Part-time Lecturer in Mathematics*.

ADOLPH CASO, B.A. (Northeastern University), M.A. (Harvard University), *Instructor in Italian*.

LEONARD A. CATZ, M.S., Ph.D. (Hebrew University, Jerusalem, Israel), *Assistant Professor of Physics*.

KENNETH F. CERNY, B.S. (Marietta College), *Lecturer in Chemistry*.

CHRISTOPHER CHASE, B.A. (Wesleyan University), M.A. (Indiana University), *Part-time Lecturer in English*.

BARBARA CHASIN, B.A. (City College of New York), Ph.D. (University of Iowa), *Assistant Professor of Sociology*.

GEOFFREY CLIVE, B.A. (Colgate University), Ph.D. (Harvard University), *Associate Professor of Philosophy*.

CARL COHEN, Studienreferender Studienasesor (University of Frankfurt), M.A. (Harvard University), *Instructor in Mathematics*.

JEAN COLLIGNON, Licence d'Anglais, Diplôme, d'Etudes Superieures d'Anglais (Toulouse), Agrégation d'Anglais (Sorbonne), *Professor of French*.

MARJORIE COLLINS, B.A. (University of Wales), M.A. (Hunter College), Ph.D. (University of Michigan), *Assistant Professor of English*.

JUAN E. CORRADI, B.A., M.A. (Brandeis University), *Instructor in Sociology*.

PATRICIA CUMMING, B.A. (Radcliffe College), M.A. (Middlebury, France), *Part-time Lecturer in English*.

MARY D. CURRAN, B.A. (University of Massachusetts), M.A., Ph.D. (University of Iowa), *Professor of English*.

ELIZABETH A. DAVIS, B.A. (Mt. Holyoke College), Ph.D. (Brandeis University), *Assistant Professor of Biology*.

JACQUELINE FOURÉ DESUZE, B.A. (Ohio State University), M.A. (University of Wisconsin), Diplôme d'Etudes de Français (University of Grenoble), Diplôme d'Etudes Superieures de Français (Sorbonne), *Instructor in French*.

PAUL DEVORE, B.A. (Harvard College), M.A. (University of Chicago), *Instructor in Anthropology*.

LYNN F. DHORITY, B.A. (University of Colorado), Ph.D. (Harvard University), *Assistant Professor of German*.

JOHN K. DICKINSON, Ph.D. (University of Marburg), *Assistant Professor of Sociology*.

- ALBERT J. DIVVER, B.A. (Boston College), M.A. (University of Michigan), *Instructor in English*.
- PRISCILLA DOFF, B.S. (Tufts University), *Lecturer in Biology*.
- DAVID EDELSTEIN, B.A. (University of Pennsylvania), M.A. (Harvard University), *Instructor in Psychology*.
- DENNIS C. EHN, B.A., M.A. (Harvard University), *Lecturer in Physics*.
- ERNEST S. ELYASH, B.A. (University of Pittsburgh), Ph.D. (Cornell University), *Associate Professor of Mathematics*.
- LOUIS ESPOSITO, B.A. (St. Peter's College), M.A., Ph.D. (Boston College), *Assistant Professor of Economics*.
- CLARA ESTOW, B.A. (Southern Illinois University), M.A. (Brandeis University), *Instructor in History*.
- ROBERT R. EVANS, B.A. (Harvard University), Ph.D. (Brandeis University), *Assistant Professor of Theatre Arts*.
- SO-FEI FANG, B.S. (National Taiwan University), Ph.D. (University of Pennsylvania), *Assistant Professor of Mathematics*.
- PETER T. FARCO, B.S. (Manhattan College), M.A. (Boston University), *Instructor in Physics*.
- MARTHA FINNEY, B.A. (Stanford University), M.A. (University of Iowa), *Instructor in English*.
- CLIVE FOSS, B.A. (Harvard College), M.A. (Harvard University), *Instructor in History and Classics*.
- ALAN FRANCIS, B.A. (State University of New York), M.A. (Harvard University), *Lecturer in Spanish*.
- BARNEY FRANK, B.A. (Harvard College), *Part-time Lecturer in Politics*.
- KENNETH FREDERICK, B.A., M.A., Ph.D. (University of Michigan), *Assistant Professor of English*.
- JOHN A. FREEBERG, B.A. (Harvard College), M.A., Ph.D. (Harvard University), *Associate Professor of Biology*.
- SEYMOUR FRIEDLAND, B.A. (Brooklyn College), M.A., Ph.D. (Clark University), *Assistant Professor of Psychology*.
- GABRIEL GABELLA, M. ARCH. (Ecole Polytechnique Federale, Lausanne), *Part-time Lecturer in Art*.
- ROSALIND COHEN GABIN, B.A. (Hunter College), M.A. (Johns Hopkins University), Ph.D. (University of California, Berkeley), *Assistant Professor of Spanish*.
- SANFORD B. GABIN, B.A., M.A. (Princeton University), *Instructor in Politics*.
- PAUL A. GAGNON, B.A. (University of Massachusetts), M.A., Ph.D. (Harvard University), *Professor of History*.
- MONIQUE GARRITY, B.A. (Marygrove College), M.A., Ph.D. (Boston College), *Assistant Professor of Economics*.
- SUZANNE M. GASSNER, B.A. (City College of New York), M.S., Ph.D. (Syracuse University), *Assistant Professor of Psychology*.
- ROBERT I. GELB, B.S. (Polytechnic Institute of Brooklyn), Ph.D. (University of Wisconsin), *Assistant Professor of Chemistry*.
- S. CLARK GILMOUR, C.A. (Institute of Chartered Accountants, B.C.), M.B.A. (Columbia University) *Part-time Lecturer in Economics*.
- EDWARD S. GINSBERG, B.A., Sc.B. (Brown University), M.S., Ph.D. (Stanford University), *Assistant Professor of Physics*.
- EDWIN GITTLEMAN, B.A., M.A., Ph.D. (Columbia University), *Associate Professor of English*.
- M. COLIN GODFREY, B.Sc., M.A., (University of British Columbia), *Instructor in Mathematics*.
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Location of Departments, UM/B

MAP KEY

Building 1—100 Arlington St.

Auditorium—basement
Biology Department—12th floor
Chancellor's Office—12th floor
Chemistry Department—13th floor
Dean's Office—12th floor
Faculty Senate Office—12th floor
Financial Aid Office—4th floor
Health Services—mezzanine
Labor Relations—3rd floor
Language Laboratories—2nd floor
Natural Sciences Office—13th floor
Philosophy Department—3rd floor
Physical Plant Office—2nd floor
Physics Department—11th floor
Science Laboratories—8-11th floors
Science Library—mezzanine
Student Affairs Office—4th floor
Treasurer's Office—1st floor
Vice-Chancellor's Office—12th floor

Building 2—142 Berkeley St. (Sawyer Bldg.)

Advising Office—4th floor
Afro-American Studies—4th floor
Art Department—4th floor
Book Store—1st floor
Cafeteria—basement
Career Planning—4th floor
Classics Department—4th floor
Humanities Office—4th floor
Russian Department—4th floor

Special Admissions—4th floor

Teacher Certification Office—4th floor

Building 3—130 Columbus Ave.—Library

Building 4—330 Stuart St. (Salada Bldg.)

Economics Department—6th floor
History Department—6th floor
Politics Department—6th floor
Psychology Department—8th floor
Social Sciences Office—6th floor
Sociology-Anthropology
Department—6th floor

Building 5—172 Columbus Ave. (Hale Bldg.)

English Department—2nd floor
Summer School Office—2nd floor

Building 6—131 Arlington St. (Avis Bldg.)

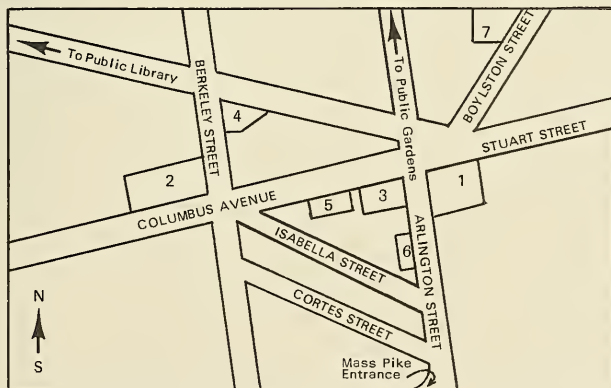
Admissions Office—1st floor
Business Office—2nd floor
German Department—2nd floor
Personnel Office—2nd floor
Planning & Development Office—2nd floor
Registrar's Office—1st floor

Building 7—80 Boylston St. (Little Bldg.)

French Department—6th floor
Italian Department—6th floor
Mathematics Department—8th floor
Spanish Department—8th floor
Theatre Arts—6th floor

Building 8—20 Boylston St. (not shown)

Music Department



Index

Academic Divisions	31	Language Laboratories	9
Humanities	31	Latin (Classics)	34
Mathematics	57	Library	9
Natural Sciences	60	Loans	18
Social Sciences	66		
Administration, Officers of	92	Mathematics	57
Admission	10	Music	49
Advanced Placement	11		
Advising and Study Counseling	22	Out-of-State Students	15
Afro-American Studies	78		
Anthropology (and Sociology)	76	Philosophy	50
Art	31	Physics	63
Attendance	27	Politics	72
		Pre-Medical Program	66
Biology	60	Psychology	74
Calendar, Academic	5	Rattigan (Brian) Prize	28
Career Planning and Placement	22	Requirements (see individual departments)	
Chemistry	61	Retention Requirements	24
Classics	34	Russian	51
Conduct	27		
Correspondence	4	Scholarships	18
Course Changes	24	Social Sciences, Divisional Courses	78
Courses	31	Sociology-Anthropology	76
		Soto (Luis Emilio) Prize	28
Economics	66	Spanish	52
English	36	Special Admissions	11
Expenses	14	Student Affairs	21
		Students, Classification of	13
Faculty of Resident Instruction	82		
Financial Aid	17	Teacher Certification Program	79
French	42	Theatre Arts	54
		Transfer Students	11
General Information	9	Trustees of the University	91
German	45	Tuition	13
Grades	22		
Graduation Requirements	29	Veterans	17
Greek (Classics)	34		
		Withdrawal	26
Health Services	20	From a course	25
History	68	From the University	26
Honors Programs	28		
Humanities, Divisional Courses	55		
Italian	47		



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PARENTS NEWSLETTER

UNIVERSITY OF MASSACHUSETTS
FOR PARENTS AND FRIENDS OF THE UNIVERSITY
AMHERST - BOSTON - WORCESTER

VOL. LXII, NO. 4

UNIVERSITY OF MASSACHUSETTS BULLETIN

22 MARCH 1970

2,500 Graduate at 100th Commencement

The sun shone on Alumni Stadium May 30 as the 100th commencement ceremonies began on the Amherst campus. It was another commencement when, fortunately for the thousands of friends and relatives, those rainy day tickets did not have to be used.

Some called it Lederle Weather, noting that in the 10 years Dr. John W. Lederle has presided at commencements, the ceremonies have not had to be called indoors. Graduates received two rainy day tickets each, and only guests who held such tickets would have been admitted indoors.

About 2,500 undergraduate and graduate degrees were awarded in the traditional graduation which included a few changes to show the feelings on current events by members of the University Community.

The youthful and older generations should listen to each other, said University President Lederle. "Closed youthful ears reflect an arrogance and a conceit that deserves the same condemnation we rightly direct toward a non-listening older generation. The current vogue, which praises the notion that only youth has or can find the answers to our social problems," he said, "is reduced to absurdity when a student revolutionary wakes up on the morning of his thirtieth birthday."

Kingman Brewster, Jr., president of Yale University, gave the main address. The war in Southeast Asia and student unrest concerned Dr. Brewster. He noted that, "Along with peace and freedom as American objectives stands the dedication to the dignity of every man, simply because he is a man." Human dignity, he said, rests on the "sense of fairness," and a "peculiarly American trait" of human dignity is "friendliness."

"There is plenty of room for honest difference without turning sores of disagreement into festers of distrust," said Dr. Brewster. He added that, "He who would sow malice among us commits treason to those who died so that their fellow men might survive in dignity."

Monsignor David J. Power, Catholic chaplain, gave the invocation and asked for a moment of silence in tribute to those who have lost their lives in the Southeast Asia War and on American campuses.

Class President David J. Veale of Wakefield spoke of the commencement changes, and he asked his audience to improve their country. He said, "We had hoped that others could see our love for this country by our attempt to show concern for its welfare. We want to better America, not hurt it. Help us before it is too late." The senior class president said the instances of protest at commencement were "appropriate"



Chairman of the Board of Trustees Joseph R. Healey presents an honorary degree to retiring University President John W. Lederle during commencement exercises. In background at left is Assistant Dean of Administration William C. Venman, who prepares the president's doctoral hood.

and that "a joyous commencement" would have been "inappropriate" because, "If the Southeast Asian War continues, too many of the men in the graduation class will be forced to kill or be killed."

Graduating students marched into Alumni Stadium to the beat of the French Drum Roll, and they marched out to the tune of "We Shall Overcome." The Commencement Task Force, composed of University administrators and senior class representatives, had agreed with a vote of the senior class to amend the 1970 Commencement ceremonies to include protest over the Vietnam war and other nationwide issues.

Many caps and gowns were stenciled with peace symbols. Some seniors wore arm bands. Some seniors had American flags attached to the sleeves of their gowns. The differences of opinion were shown quietly within the solemnity of Commencement.

Another change in tradition was a talk by Dr.

Seymour Shapiro, acting dean of the College of Arts and Sciences and winner of this year's Metawampe Award which goes to a faculty member voted outstanding by the students. Dr. Shapiro explained the student strike at the University.

Honorary degrees were given to 12, including outgoing University President John W. Lederle and incoming President Robert C. Wood. Other recipients were: Kingman Brewster, Jr., Yale University president, and Commencement speaker; Ruth M. Adams, Wellesley College president; Arthur Fiedler, Boston Pops Conductor; J. John Fox, judge of Norfolk County Probate Court; Robert Francis, Amherst poet; Leo Goldberg, Harvard University astronomer; Agnes Mongan, curator of Harvard's Fogg Museum; Edgar A. Perry, former president of the Associate Alumni; Roger L. Putnam, vice-chairman of the Massachusetts Board of Regional Community Colleges; and James Reston, vice president of the "New York Times."

Campus Center Rates Are Set

Fees have been set for students and visitors at the Murray D. Lincoln Campus Center, which will open in the fall. The 11 story, air-conditioned building adjacent to the Student Union will have 114 rooms with accommodations for 220 people, and conference and seminar rooms for 1,500 people. Parents of students may stay at the Center if they register through their children. The building will also house a book store, cafeteria, coffee shop, banquet rooms for conferees, and an elegant dining room. Total cost of the Center is paid by conference and student funds, with no cost to the taxpayer.

It will be a student center and continuing education center, and a laboratory for restaurant and hotel management students.

Undergraduate students will be assessed \$24 a semester for use of the campus center; and graduate students, \$19 a semester.

Fees for parking in the Campus Center Garage and for staying overnight in the 114 rooms were voted by the Board of Trustees meeting at the Amherst Campus in May.

Accommodations

Twin bed room: single occupancy, \$14; double occupancy, \$18.

One-room suite: single occupancy, \$18; double occupancy, \$22.

Two-room suites, single occupancy, \$27; double occupancy, \$31.

A child's rollaway cot will cost \$3, and there will be a 10 percent reduction in costs for stays of seven or more days.

Parking

25 cents, first hour

15 cents, each additional hour

\$2 a day maximum

\$75 a semester for students

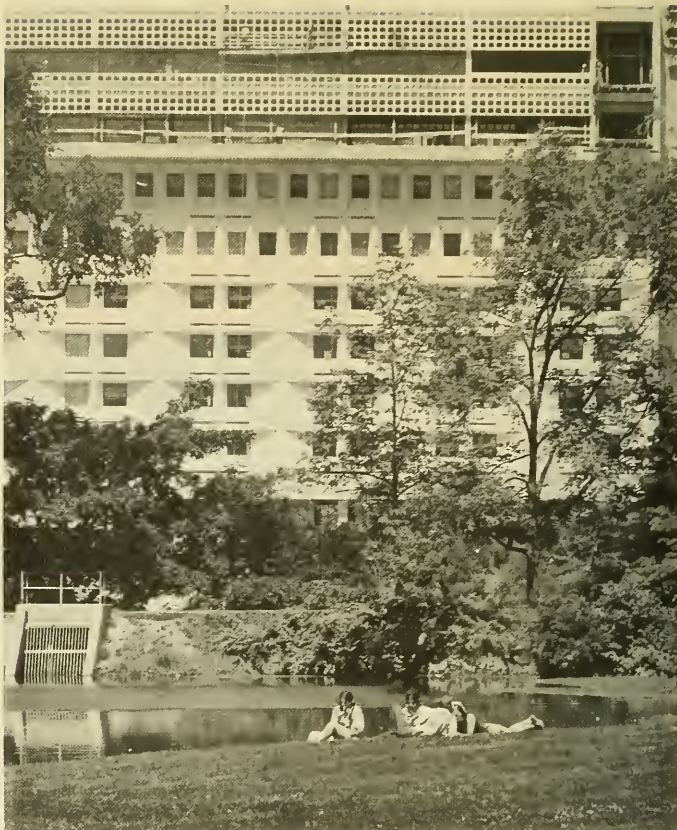
\$85 a semester for others

\$17.50 a month for students—June, July, August

\$22.50 a month for others — June, July, August

\$185 for students for 12 months

\$250 for others for 12 months



Students talk and study by the campus pond, in view of the new Campus Center.

Housing Plan Prepares for Overcrowding

A six-part plan has been developed to cope with next fall's housing problem at the University of Massachusetts, it has been announced by Dean of Students William F. Field.

A recent construction strike means that three residence halls housing 1400 students, scheduled for completion by September, will not be ready.

According to Dean Field, the problem of overcrowding can be averted only by student cooperation. After meeting with student representatives, the administration has announced a plan of voluntary cooperation to ease the housing situation in the fall.

The main feature of the plan is a one-semester plan of voluntary tripling in which students would receive a 30 percent reduction in room rent. A special effort will be made during summer counseling to urge incoming freshmen to accept the tripling plan.

Members of next year's junior and senior classes will be permitted to seek off-campus housing if they notify the Housing Office by June 1 of their intention to withdraw from the residence hall system.

Students whose homes are within commuting distance of the campus are urged, but not required, to withdraw from campus housing and commute for the first semester.

Fraternities and sororities that expect to have empty beds are being encouraged to offer space to individual students. The University housing office will work with the fraternities and sororities to find students for these rooms.

The number of beds for single graduate students will be limited to the number of beds that were available this year in Prince House.

The Murray D. Lincoln Campus Center will be used during the first week of the semester for temporary bed space until empty beds in residences can be identified and filled. In addition, all students who have reserved rooms will receive an official letter from the University notifying them that reserved rooms in residence halls will not be held for them beyond registration day.

The strike, which began April 1, has made it impossible for the contractor to make up the lost

time in order to have the residence halls ready for September. It is expected that at least two of the three new units will be ready for occupancy by the spring semester, however.

"Because we have changed the system by requiring room deposits next year," Dean Field said, "we expect to have no empty rooms as in past years. We expect that there will be a shortage of about 1000 beds because the two new units will not be completed.

"If students will cooperate with us, I am sure there will be no hardship for anyone in September."

There will be no cutback in the size of the incoming freshman class because of the housing problem.

Health Fee Increased

The Student Health Fee has been increased \$5 to \$35 a semester, effective for the fall semester. This fee covers expenses for medical care students receive on campus.

Dean Explains Campus Strike Highlights

BY SEYMOUR SHAPIRO
Acting Dean
College of Arts and Sciences

EDITOR'S NOTE: The following article, felt by many to be the most informative and factual account of the recent "Student Strike" on the University's Amherst campus, was initially presented verbally by Dean Shapiro as part of the 1970 Commencement program May 30, 1970, in Alumni Stadium.

My remarks are directed to the recent campus student strike which gave to the graduating class before us a final set of memories quite different from those of previous graduating classes.

I shall attempt to give highlights of the Strike with two objectives in mind. First, to set the record straight for those who followed events only through the newspapers, and second, to start all of us in the University community on the road to an assessment of what happened—an evaluation of gains and losses from this unusual experience.

On Friday the first of May the "Daily Collegian" carried the front page headline, "Nixon OK's Cambodia Attack."

A smaller headline read "4000 troops to New Haven." This referred to the demonstration scheduled for the very next day on behalf of the eight Black Panthers facing trial in New Haven. The confluence of these two events presented an assembled group, largely students deeply aggrieved by one issue, with a second major issue. A frustration level high enough to have gathered them to New Haven from all over the country rose even higher as they pondered the escalation of a war they believed to be senseless. When the students left New Haven many had agreed to carry back to their campuses a plan for a common course of action.

Word of this "Strike Plan" began to spread through the campus on Sunday, May 3.

The "Daily Collegian" of the next day carried the one-word headline "STRIKE" superimposed on a stylized clenched fist. The caption beneath this figure in the "Collegian" read, "A Nation-Wide Student Strike Against the Nixon War Policy in Asia and the Administration's Policy of Alleged Political Suppression Gained Support at 20 Universities across the Nation Yesterday, Including UMass." As the Strike spread, the clenched fist sprouted all over campus, on walls, windows, shirts, jackets and armbands.

The Strike call included three issues:

1. That the United States cease its expansion of the Vietnam War into Cambodia; that it unilaterally and immediately withdraw all forces from Southeast Asia;
2. That the United States government end its systematic oppression of political dissidents and release all political prisoners such as Bobby Seale and other members of the Black Panther Party; and
3. That the Universities end their complicity with the United States war machine by an immediate end to defense research, ROTC, counterinsurgency research and all other such programs.

Some faculty and students felt more strongly about the Cambodian invasion than about the other two goals; others believed all three to be

very closely linked — thinking of them as symptoms of an ailing society.

Approval was quickly given to establish a Strike Headquarters in the Student Union, a building financed entirely by student fees, and responsible to the Student Union Governing Board. A Strike Steering Committee was established to which each dormitory, sorority and fraternity was asked to elect representatives. On Monday evening the main issue was whether to join the Strike. Debates were held in dorms. Mass meetings went on for hours in the Student Union. The Student Senate, the Senior Class and the Freshman Class voted to support the Strike. A statement from the President's Council of the Freshman Class may help to explain the large-scale support for the Strike:

"The seniors entered the University in 1966 and there was an unconstitutional war. They are graduating in 1970, and there is still an unconstitutional war going on. We, as Freshmen, entered the University in 1969 and there was an unconstitutional war. Must we leave this University in May, 1973, with the same or larger war hanging over our heads?"

The atmosphere of Monday evening was intensified by the stunning news of the death of four Kent State students. This sobering and shocking event reinforced both a sense of outrage over national policy and the striker's resolve to protest non-violently.

The Strike formally began on Tuesday, May 5. The Collegian listed 62 colleges and universities which had joined the strike movement. That list grew to more than 200 over the next few days. There were picket lines around all major academic buildings. The Strikers had pledged themselves to be non-obstructive. The official policy was that classes were to continue and those who wanted to attend were free to do so. Order was maintained by over 100 volunteer marshalls, recruited from student and faculty ranks. In maintaining order, the University administration agreed to place primary reliance on the marshalls. The confidence in the marshalls was justified—they remained unobtrusive but present wherever there was a possibility that protest might turn violent. The dedication of the campus to peaceful demonstration and discussion prevented any serious incidents over the several weeks of the Strike. Campuses elsewhere were not so fortunate. Tuesday had earlier been planned as Spring Day, a long-cherished traditional day of frolic on our campus. Spring Day was cancelled. No one seemed to miss it.

Late Tuesday afternoon, the Faculty Senate convened. The meeting-room was jammed. Some faculty felt intimidated by the presence of so many students, anxious for faculty endorsement of Strike aims. Debate centered about whether the Faculty Senate should restrict itself to academic matters. Some faculty members argued that in the interests of academic freedom the faculty should not take sides on political issues.

In the end, a motion was passed which commended the strong intent of the students to conduct the Strike in a nonviolent manner. The motion supported the Strike goal dealing with

the war in Southeast Asia and went on to state that no punitive measures should be taken against students engaged in lawful protest. However, the question of whether the Faculty Senate should take a stand on political issues is still a vexing one. It will certainly continue to be debated on this and other campuses next year.

Wednesday saw the beginning of workshops, designed by the Strike Committee to supplement or replace regular classes. These discussion groups were a dominant educational feature of the Strike.

Workshops were sometimes led by undergraduate or graduate students, but mainly by faculty members who added these to their normal teaching schedule. Attendance was high and enthusiasm for the discussions even higher. Let me mention some subjects covered:

The Economics of the War
Background to Conflict in Southeast Asia
Racism
Forms of Political Action
Social Psychology of War
Political Rhetoric
Powers of the President
Why be Non-Violent? How to be Non-Violent
Why Strike?
Literature & Revolution
Practical Politics
Vietnam & the Cold War

On Wednesday I led one workshop on the topic "The People and Congress." I found some 70 students anxious to learn how to be effective within the system by influencing their congressmen. Out of this discussion several message centers were organized in dormitories, where paper, envelopes and stamps were provided. Students, regardless of whether they supported or opposed the war, were encouraged to stop and write to their Congressmen. Similar tables in the Student Union were manned around the clock by students and faculty, both hawks and doves. The flow of mail from Amherst to Washington that week was enormous.

Another workshop in which I participated brought together some 300 students for discussion of Physics, Research and the war. Some came with minds made up, but the greater number came to listen and learn. With no credit and no exams, most stayed for two hours as we discussed the role of research in a University, the moral responsibility of a scientist for the uses to which his research is put, and the right of a scientist to develop the weapons his country requires.

Some workshops met only once; others continued for many days, becoming short courses in the war, political persecution, racism, and the military-industrial complex and its relationship with universities. Some serious students claim that workshops were the most exciting and productive educational experiences which they have had at the University, which may tell us something about our regular programs.

The high attendance at workshops illustrates the success of the Strike in redirecting the resources of the University toward major issues faced by the Nation. Study of such issues is a proper concern of the University. It should supplement the regular activities of the campus

(Continued on page 4)



Commencement 1970 had sunshine, 2,500 graduates, some quiet protest of the war in Southeast Asia, and an explanation of the campus strike. It was the last commencement Dr. John W. Lederle would attend as president, and the first Dr. Oswald Tippo attended as chancellor of the Amherst campus.

and must never, for any prolonged period of time, replace them entirely. Some students and faculty believe that the University came dangerously close to losing the neutrality and objectivity necessary to academic freedom during the Strike period. This too will be a subject of discussion next fall.

By Thursday the pattern of the Strike had been established. Workshops were regular events, most faculty were holding classes as scheduled for those students who wanted to attend, the marshals were conscientiously following their pledge, and the Strike Steering Committee was meeting at least daily to exercise direction and to cope with problems as they arose. And problems did arise.

One problem concerned semester grades. By May 5th, 77 class days of the semester had been completed; only seven class days and final examinations remained. Completing courses in the normal way was, of course, an open option. However, it was clear that many students were prepared to sacrifice the last part of the semester in favor of participating in Strike activities. But they were not willing to sacrifice the accomplishment of the preceding 77. Some special grading arrangements seemed called for. Feeling ran high while we struggled to resolve the issue. It took two tries and a lot of confusion before a policy acceptable to both the

Faculty Senate and to most students was found. Still, the whole episode leaves an after-taste. I was disappointed to discover that many students were willing to follow the dictates of conscience only after a guarantee that no price would be extracted.

Another problem developed at Dickinson Hall, home of the ROTC program. One goal of the Strike was to end ROTC on this campus. A militant splinter group decided that an appropriate means to this end was to disrupt normal activities in Dickinson Hall. The group declared the building a center for women's liberation activities and remained there day and night. They were quickly joined by a group of marshals and then by a group of cadets. The presence of these different interest groups kept tension to a moderate level, although there were moments of grave concern. When one remembers the fires and the fights over ROTC elsewhere, our problems seem trivial. The disruption at Dickinson Hall became a vehicle for mutual education. On entering the building, day or night, one would encounter members of the three groups discussing with each other issues such as the nature of nonviolent protest, the engagement of the University in military training, and the war in Southeast Asia. In the end, everyone talked himself out and the disruption ended. While there is better

understanding, agreement is still far off. ROTC will continue to be a campus issue next fall.

Friday, May 8, was Legislators Day. About fifty members of the General Court visited the campus. They visited workshops and had an opportunity to talk to students who were eager to tell them what the Strike was about. Similar programs were arranged for the many parents who visited over the weekend.

The first week of the Strike ended on Saturday with a large all-night party by the pond, the only activity reminiscent of the non-lamented Spring Day. Tensions were released by high decibel rock music and even some skinny dipping in the pond. Of all the events during the Strike, this party was the one which most upset and disturbed our neighbors and passers-by.

The Strike went on in full force for another week. Activity gradually declined as final examinations came and more students left campus for the summer. There is much that a short account must omit. Let me conclude by saying that there are many ways in which love of one's country may be expressed. The nationwide Strike, for most of its participants, was a demonstration by a group impatient for change but intensely concerned to see their country emerge with a reinforced, renewed dedication to peace and the promises of the Bill of Rights.

A Return Stay for Oswald Tipppo

The first Chancellor at the University's Amherst campus, Dr. Oswald Tipppo, 59, has been on the campus since 1964 when he was appointed Provost, but this has been his second stay here. He received his bachelor of science degree in botany from the University in 1932, when it was called Massachusetts State College.

In 1937, after earning his Ph.D. degree in biology, he became an instructor of botany at the University of Illinois. In 1948 he was named chairman of the department, the next year chairman of the division of biological sciences, and four years later dean of the graduate school.

Dr. Tipppo went to Yale University in 1955 as Eaton Professor of Botany, and became chairman of the department, director of the botanical laboratories, director of the Marsh Botanical Garden, and a fellow of Yale's Berkeley College. The University of Colorado gave Dr. Tipppo the provost's position in 1960 and three years later he became executive dean of arts and sciences at New York University.

Here are excerpts from recent talks and statements by the Chancellor:

"I suspect that our very affluence has (also) contributed to the root causes of student unrest. An affluence which has freed our youth from the labor formerly demanded of previous generations of high school and college youth. The resulting leisure has provided young men and women the opportunity to think, to examine our way of life, to ponder over the social injustices of the world, the hypocrisies, and the corruption."

"(Students) seem to forget that their real bone of contention is our national policy. If they do not like it, they should try to change it, but instead they lash out at the visible and convenient instruments of that policy—ROTC, war-related research, recruiting. Some of the extremists among them are so positive of the rightness of their position that they would trample on the rights of those who think otherwise."

"Our mode of (campus) governance can be improved if we can find a way of accommodating the commonality of our interests as a group with our specialization of interests as students and faculty members. We must find a form of campus governance better suited to our needs. Most other things that trouble us will then fall into place more easily, for we shall have ways of coping with them. I therefore ask that the three Senates (Faculty, Student, and Graduate Student) establish a Joint Governance Commission."

"We must strike a balance between the immediate interests of our campus community and the needs of the University as a social institution. In the process some sacrifices may be required. We may have to endure mud."

"Since the University is a social institution, representation of the public interest will always be a legitimate and necessary part of any plan of campus governance. This does not imply that the existing relationship between the Board of Trustees and the campus is the best. The Board is prepared to have the campuses exercise greater autonomy. Indeed, this was one of the fundamental points in the system wide reorganization. We must now convince the Board of our ability to handle internal affairs."



President Wood



Chancellor Tipppo

New President to Oversee Three Campuses From Boston

Dr. Robert C. Wood, 17th President of the University of Massachusetts, is the first to have his offices in Boston. In the new University organization voted last fall by the Board of Trustees, President Wood will direct operations for the three campuses, while a chancellor in Boston, Worcester, and Amherst will oversee day-to-day operations of his campus.

Dr. Wood was appointed May 13 by the Board of Trustees, and assumed his new duties July 1. He was serving simultaneously as chairman of the Board of Trustees of the Massachusetts Bay Transportation Authority and head of M.I.T.'S Department of Political Science, and director of the Joint Center for Urban Studies at M.I.T. and Harvard.

In 1966 he became Under-Secretary of the U.S. Department of Housing and Urban Development and in the last month of President Lyndon B. Johnson's Administration was named Secretary. Before going to Washington he was a member of the Faculty Policy Committee of the Joint Center, and in January, 1969 he returned to Cambridge to a position as professor and head of the M.I.T. Department of Political Science and director of the Joint Center.

A recognized authority on urban problems, the new President was a member of President Johnson's Task Force on Urban Problems in 1964 and 1965 and a member of the pre-inaugural Task Force on Housing established by President John F. Kennedy.

Having worked 10 years with the Joint Center for Urban Studies, and having been director for more than a year, he believes, he has said, that the Center can "advance the quality of life in our cities." He added, "I hope the University of Massachusetts System will have an opportunity to work in collaboration with the Center or to

develop complementary and parallel enterprises."

Here are other quotations from recent talks by the new President:

"Our system needs to revive the interest in urban affairs, work seriously to resolve pressing issues of racism, deprivations, and non-community behaviour. In brief, we have a task of political craftsmanship ahead, precedent to the actual building and rebuilding of cities. We have to learn how to make our genuinely new politics of innovation work."

"We need to improve our educational processes rapidly; to distinguish among kinds of higher education carefully; to match individual aspirations and capabilities with programs much better than we have before. But we must never waiver in our faith in education to insure productive enterprise, rational thought and energetic citizenship."

"We must never practice politics on the university for the sake of politics or practice."

"At this time of special anxiety, when doubts, uncertainties and fears sweep the nation, it is important to say again, with Jefferson, that the foundation of this democracy rests upon as close to universal education as it is humanly possible to achieve and as much education as it is humanly possible to absorb."

Retiring President Receives Tributes

Honors bestowed on University President John W. Lederle as he retires this summer after a decade as President have included an honorary degree, a testimonial dinner, and a tribute from the State Legislature.

Dr. Lederle will continue at the University as Joseph B. Ely Professor of Government after a year of sabbatical leave during which he will prepare his courses. He and Mrs. Lederle will move from the President's House on campus to a home they are having built in nearby Pelham.

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Board Votes Room Increase

The University of Massachusetts Board of Trustees has voted to increase room rents \$100 and \$110 a year starting next fall.

Under the plan, rents will increase from \$400 to \$500 in traditional residence halls, from \$450 to \$560 in the newer Southwest and Orchard Hill Residences and rent will be established at \$650 for the suite-type residences now under construction.

The rent proposal came from the President's Committee on Room Rents and Fees which was formed when students protested a higher rate proposed by the administration in January.

The President's committee, composed of students, faculty and administration, was able to recommend a reduced rent increase based on enforcement of higher occupancy levels, deferred payment of the principal on several residence halls until permanent financing is available, and because interest rates have dropped since January.

Major reasons for the rent increase are the retroactive salary increase granted all state employees last fall, rising construction costs, inflated bond interest rates, and increased maintenance and supply costs.

In an attempt to see that no student is forced to leave school because of increased expenses, the University has requested extra scholarship and student loan funds for the 1970-71 academic year from state and federal sources. Although Governor Francis W. Sargent cut the University's scholarship request back to last year's appropriation, the University hopes that the cuts will be restored by the Legislature. If they are not, the University will make a supplemental request at a later date.

The University has also requested more federal scholarship and loan funds, and has been notified that allocations in three categories have been recommended. Actual award of funds under the allocations, however, depends on Congressional action.

The Trustees also voted to institute a student housing deposit. Freshmen will pay \$100 at the time of their acceptance, which will be used as a guarantee of a room assignment in University



Legislators and students attend one of several workshops during Legislators' Day, May 8, on the Amherst campus. From the left, are: Rep. Ann Ganett of Wayland (in plaid jacket), Sen. William Randall of Framingham, Sen. James Kelly of Oxford, Rep. Louis Morini of Northampton, Rep. Frank Lapointe of Chicopee, and Rep. Francis Keane of Natick.

Superb View From Tower Library

From the glass-enclosed top level of the tower Library, students will have a panoramic view of the University's campus and three ranges of hills—Pelham Hills, Holyoke Range, and Berkshire Hills.

The tower Library, which is expected to be completed before the end of 1971, will have exterior dimensions of 110 by 110 feet with 26 levels set on a two-story podium of 324 by 228 feet. Above the entrance level will be 25 levels which include nine for study, 14 for stacks, one

for rare books, and the glass-enclosed Colloquium Level with lecture rooms and exhibit facilities.

Edward Durell Stone, architect, and Raymond Werbe, interior designer, have planned this building for about 3,000 readers and a potential 2½ million volumes. The 405,000 square foot building's main level below the entrance will house the public catalog, the reference department, a browsing collection, the microfilm collection, and other features.

Five high-speed elevators will transport people and books in the tallest building in Massachusetts west of Boston, and the tallest library in the world.

The Library will open with about half its potential capacity of volumes, allowing for expansion.

The tower's tunnel will join the library to South College, the former administration building, which will service incoming books, journals, supplies, and equipment to minimize vehicular traffic in the center of campus.

housing. All other students will pay a room deposit of \$50.

The deposit money will be returned to a student when he leaves the University, unless he is dismissed for disciplinary reasons or unless he reserves a room and fails to occupy it without giving appropriate notice.

University officials believe that the room deposit system will insure fuller occupancy, thereby justifying the lower rent increases approved by the Trustees.

**UNIVERSITY OF MASSACHUSETTS BULLETIN
AMHERST, MASSACHUSETTS 01002**

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**PARENTS NEWSLETTER
FOR PARENTS AND FRIENDS
OF THE UNIVERSITY**

PARENTS NEWSLETTER

UNIVERSITY OF
MASSACHUSETTS

FOR PARENTS AND FRIENDS OF THE UNIVERSITY

AMHERST - BOSTON - WORCESTER

VOL. LXII, NO. 5

UNIVERSITY OF MASSACHUSETTS BULLETIN

JUNE 1970

Visitors Welcome At Campus Center

Tourists from on and off campus have been pressing buttons in the swift elevators of the new Murray D. Lincoln Campus Center which opened July 28. And from floor to floor these visitors have trod on corridor and lobby floors carpeted in colors ranging from gray to violet.

They've seen that a few offices have begun business at their new Campus Center quarters, the Division of Continuing Education, for example. The second floor coffee shop has served hundreds of patrons, and workers have been filling shelves along the supermarket-length aisles of the new student store.

Finishing touches to the new building are being added, as they were when the Board of Trustees met in a first floor conference room August 10.

Among the many conveniences of the center are an attached 900-car parking garage, 220 overnight accommodations for those attending conferences and for other guests of the University, conference and seminar rooms for 1,500 people, dining facilities that include a top floor restaurant with a view of the campus, a ballroom, and meeting rooms and offices for student activities.

The design is by the New York architectural firm of Marcel Breuer and Herbert Beckhard. The firm's founder, Breuer, is known for the design of such buildings as the Whitney Museum in New York City and the UNESCO World Headquarters buildings in Paris.

The building is named for the late Murray D. Lincoln, University of Massachusetts alumnus who founded the Nationwide Insurance Co. and was president of CARE for its first 12 years.

Construction of the center has been underway for over three years through the University of Massachusetts Building Authority and at no cost to Massachusetts taxpayers. Financing is on a self-amortizing basis, using income from student, continuing education and other activities. The prime contractor is Daniel O'Connell's Sons of Holyoke.

In addition to its continuing education and student activities role, the facility is designed to serve a laboratory function for the department of hotel and restaurant administration. The building is connected to the Student Union.

The air-conditioned Campus Center is constructed of architectural concrete of

contrasting textures. A spacious stone terrace covers the lower two floors; the remainder of the building is a nine-story tower.

The first floor includes a student activities area with offices and meeting rooms, a student lounge and a ballroom with a stage, cinema facilities and a seating capacity of 660. On the next floor is a large mall area with a bookshop, coffee shop, barber shop and an automatic post office. There are also sign and printing shops, plus a cafeteria with seating for 500 and a stereo listening room for students.

Floors three through seven are in the tower portion and all 116 rooms have private bath and color TV. Floor eight has meeting rooms and the administrative offices of the center; floor nine has more meeting rooms and the headquarters of the Division of Continuing Education.

The 10th floor has dining rooms and function rooms and the 11th floor houses the Top of the Campus Restaurant — a large dining room for 150 persons, smaller dining rooms, a cocktail lounge and an outdoor terrace. The Top of the Campus will be open to the University community and guests.



Stopping in the coffee shop of the new Murray D. Lincoln Campus Center is a rest stop for some visitors. At left rear is one entrance to the coffee shop and at right rear is the cash register end of the counter which extends behind the wall with the clock. Ten floors above the second floor coffee shop is another dining area, the Top of the Campus Restaurant.

Chancellor Tippo: Man In Motion

On the road from Amherst center to the University of Massachusetts a car slows down, and through the open window a deep voice asks the walking student, "Want a ride?"

Nothing unusual about this event, in Amherst or most other college towns. But this time, the voice belongs to University Chancellor Oswald Tippo.

Speaking rapidly, puffing vigorously on a cigar, dashing from one office to another looking for staff members, working long days, ready with an answer to almost any University question — that's Dr. Tippo.

About giving lifts to students, he says, "I'd like to do it all the time, but I ask myself, 'Are you encouraging what might be a bad practice, dangerous to students?' and 'Are they really students?'" Usually he limits his offers to students he knows, such as editors of the student newspaper, Peter Pascarelli and Mark Silverman. And the students enjoy telling such anecdotes about "Oz."

One of his own sons is a graduate student at the University — in the School of Education. Denis taught for two years before becoming a doctoral candidate. Another son, Ray — whom Dad explains is named after famed botanist, and "great UMass teacher," Ray Ethan Torrey — is teaching and earning his master's degree in communications in Oregon.

The family also includes Mrs. Tippo, Emmie, who is active in the Amherst Women's Club, and is an avid reader. "She spends her time looking after the things I neglect at home," says her husband. Lately she's been occupied with moving into the former President's House on campus.

Dr. Tippo's words come in rapid succession, as if he cannot take time for pauses. Sometimes he talks in phrases and sounds instead of sentences; but somehow gets his ideas across. He appears to the University community as a brisk person, sometimes brisk to the point of abruptness.

His is a busy workday, but this is not new since he became Chancellor last spring. Monday through Friday he spends about 11 hours in and out of his third floor Whitmore office, continuing business through lunch and pausing only for a 10 minute nap and then dinner. The routine, including working Saturdays and Sundays, he says, is "a way of life." He lived this way while Provost here; and before that. He has served as chairman of the Botany Department at the University of Illinois, Dean of the graduate school there, Eaton Professor of Botany at Yale University, Provost at the University of Colorado, and Executive Dean of Arts and Sciences at New York University. He is a fellow of the American Academy of Arts and Sciences, and has several other titles.

He also co-authored "College Botany," a widely-adopted text last printed in 1954 and still used by some institutions.

As Chancellor, he spends little time on botany these days. He still receives some current journals, but says, "It would take me one to two years to bone up on the field enough to give even an introductory college course in botany."

One botany connection are the apples and plums he brings to the office staff from bushels he's picked himself. Perhaps this is partially to make up to his secretaries for putting up with the cigar he seems always to have with him. In deference to Mrs. Tippo, he does not smoke at home; and feels perhaps the cigar and its wide-spreading aroma is "unfair to the secretaries."



These past several weeks he and his staff have been moving Dr. Tippo's belongings from the Provost's office to the Chancellor's office, which has just been vacated by retiring President John W. Lederle. With the move, he says, he is "trying to turn over a new leaf" (more botany?) by reorganizing his personal filing system. This means, he explains with a small glint in his eyes, that his stacks of printed documents will at least be kept off the floor, though perhaps not off the tables, shelves, and chairs.

This accumulation of printed matter reflects his intense interest in keeping up with things. In addition to his "must" reading, he reads magazines, including "Harper's" and "Atlantic," "Science," and "Mass. Review," and is currently going through Peter Schrag's "Village School Downtown," a report on city schools.

It is difficult to imagine Oswald Tippo walking slowly anywhere. Dashing through the corridors of the administration building, he is business and courtesy without really stopping. Almost in flight he will stop at the door of a new staff assistant's office to ask, "How're things going?"

And through the rush he sees several groups of students each week. Student Senate officers meet with the Chancellor weekly, and every other week he attends the administration's informal discussion sessions where the students bring up topics of particular interest to them.

His relation to students is based on "persuasion." He refers often to the incident

last spring where Hubert H. Humphrey was heckled from a minority of an audience of several thousand, and left the stage without speaking.

"I don't know of any way except persuasion," he says, to prevent such demonstrations in the future. He hopes to convince such students who would disrupt speeches to give the speakers "a fair chance," and "to allow all points of view to be expressed." Then, he said, they may ask the "hard and embarrassing questions."

In his volumes of reading material is a newspaper report of a national Harris Poll which states that, "Younger students are entering college with increasingly liberal, far-left orientations." Notes Dr. Tippo, "They come to us this way (as activists)."

His future concerns for the students include strengthening the new library, which has just received a special \$2 million in state appropriations for books; continuing to improve the quality of the faculty; keeping a watch on the co-ed dormitory situation. "There has been," he notes frankly, "a problem in connection with residential hall visiting. The students must take greater responsibility."

In a talk at Washington State University in March, 1968, Dr. Tippo spoke of the student campus rebellions. He weighed the positive and negative of many of today's college-age people.

"Certainly there is much to criticize with respect to the behavior of our college-age population. There is a lack of humility, if not downright arrogance, a lack of good taste, a lack of manners, a lack of dignity. Much of their activity is non-intellectual, emotional, with perhaps an over-emphasis on action. They say, 'To the devil with scientific objectivity, we want action now' — always now.

"On the positive side there is much to praise. At least, our students are no longer apathetic. They are concerned about their environment and about national and international problems. They are certainly no less idealistic. They are not satisfied with mere talk; they want action. And it is well to remember that even though there are some extremists, they represent a very small fraction of any student body."

Last spring during student-sponsored Legislators' Day, student organizers milled around the lobby of Whitmore Administration Building to greet incoming legislators. One student host approached a spectacled middle-aged man and asked, "Are you a representative or a senator?" The man hesitated a moment. Then, turning the pages of a campus newspaper, he pointed to a photograph of himself and asked, "Recognize him?" The embarrassed student did, then.

Chancellor Tippo.

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UNIVERSITY OF MASSACHUSETTS

Room Rent Policy Helps

Registration day housing inconveniences are expected to be less than anticipated this year because of a new room rent deposit policy.

Students who reserved housing for the fall semester were given 45 days prior to registration, Sept. 9, to withdraw their reservations or forfeit the room deposits, (\$50 for continuing students; \$100 for new and returning students). University housing officials say that the new system will give them a good look at the number of vacancies and triples several days before the semester begins.

In previous years, students had until registration day to pay their semester bills, and dormitory rooms were held for 10 days after that for students who did not register on time.

A construction strike last spring halted progress on three residence halls which were to accommodate over 900 undergraduate and graduate students in September. So, the administration began a six-part plan to help alleviate overcrowding conditions.

Through the plan, freshmen were asked to triple voluntarily, and thereby receive a 30 percent rebate on room rent. By the end of July about 325 freshmen had volunteered.

The plan also meant asking, though not requiring, students within commuting distance of campus to withdraw from campus housing; encouraging fraternities and sororities with empty beds to rent to individual students; limiting the number of beds available to single graduate students; planning possible temporary use of beds in the new Campus Center; and permitting juniors and seniors to live off-campus if they notified the Housing Office by June 1 of such intention.

Officials expected that the 325 freshmen who volunteered to triple were not quite enough, so that more freshmen would have to be placed in triple rooms. All tripled students will be notified of their room assignments by the end of August.

Reorganization Is Approved By Trustees

A plan for reorganization at the University's Amherst campus was approved in principle by the Board of Trustees Aug. 10. The administrative reorganization plan calls for five Principal Administrative Officers serving under the Chancellor and heading these services: academic, student, public affairs, financial, and supporting and administrative.

A search committee including faculty members and students will be formed to fill the PAO positions which are occupied by interim personnel. University Treasurer Kenneth W. Johnson, who heads financial services, is the only permanent PAO.

Night Classes At UMass

The University of Massachusetts at Amherst will make University level study available to more people this fall with its first comprehensive program of evening classes on and off campus.

The new Division of Continuing Education will offer classes at Amherst and at four other locations in Western Massachusetts, according to Dr. William C. Venman, director. The division is located in the new Murray D. Lincoln Campus Center and in addition to classes, will offer a year-around program of conferences, institutes and other educational events at the center.

"The Division of Continuing Education is a self-supporting program responsible for providing university-level educational opportunity at the lowest possible cost," Dr. Venman said.

The off-campus courses will be offered in Greenfield, Holyoke, Pittsfield and Springfield. "We will cooperate with the community colleges in these places, using their facilities where they are available or making other nearby arrangements," Dr. Venman said.

The following fields will be covered either on campus or in one of the off campus locations; anthropology, art, botany, chemistry, economics, English, geography, government, history, linguistics, mathematics, music, philosophy, psychology, sociology, speech, accounting, management, marketing, investments, real estate, insurance, food planning and meal preparation, and house planning. They will be mostly introductory undergraduate courses, with a few offering graduate credit.

The courses will be taught by selected University faculty and will meet one evening a week beginning the week of Sept. 21. They will usually run for 14 weeks. Registration may be made by mail during the remainder of the month of August or at the class location during the week of Sept. 14.

Registration materials and information is available from the Division of Continuing Education, Campus Center, University of Massachusetts, Amherst 01002, telephone 545-0905.

The course fee for individual courses off-campus is \$30 per credit. On campus it is \$25 per credit. For certain courses there may be in addition a laboratory fee to cover materials and field trips.

The conference and institute section of the Division of Continuing Education will include short courses on the Amherst campus and elsewhere, lectures, conferences and other educational programs. The Campus Center has hotel, dining, parking and conference room facilities to house such programs.

According to Dr. Venman, "The need for continuing education programs in the Commonwealth is great. Some use increased leisure time to pursue educational goals, others study because they find it necessary or desirable to change occupations one or more times during their lifetime, and others who missed the chance at a university education at a normal time are now eager to continue with classes available to them in their own communities."



Pausing for a few moments during the conference of the Society for College and University Planning are University of Massachusetts officials and architects of the Campus Center which hosted the SCUP group. From the left, Architect Herbert Beckhard, Architect Marcel Breuer, University President Robert C. Wood, Trustee Chairman Joseph P. Healey, and Amherst Chancellor Oswald Tippo.

\$156M In Capital Funds Appropriated For UMass

Capital funds appropriated by the Commonwealth for the University's three campuses total \$156 million for the current fiscal year, 1971. This is an increase of \$65 million over the fiscal 1970 appropriation.

Emphasis in capital expenditures for this year is on campuses in Worcester and Boston, which account for \$143 million of the \$156 million total. Phase I development of the Columbia Point site in Boston receives \$80 million. The medical school campus at Worcester gets \$53 million for a teaching hospital, \$9.2 million additional funds for a power plant and science building and site, and \$600,000 for temporary quarters and laboratory equipment for the first and second medical school classes.

\$100,000 Grant To CCEBS

From the U.S. Office of Education to the University has come a \$100,000 grant which will be administered by the University's Committee for the Collegiate Education of Black Students (CCEBS).

The money will help support tutoring and counseling in the CCEBS program which in September will begin its third year on the University's campus in Amherst. Of the 310 students in the program the last two years, 290 are expected to return as sophomores and juniors this fall.

Dr. Randolph W. Bromery, president of CCEBS, said the University planned to admit 250 new freshmen into the program in September. Funding of the CCEBS program is dependent on five sources: the Commonwealth of Massachusetts, Ford Foundation, U.S. Office of Education, the University's Student Senate, and University alumni.

The projected cost of the program for the 1970-71 academic year is \$1,100,000, of which the University budget request to the Governor and General Court was \$750,000. This amount was reduced by the Governor's Office to \$450,000, of which \$300,000 was voted for the program by the legislature. The legislative allocation and Office of Education grant together total only \$400,000, less than half of the money needed to support this year's program.

In 1968 and 1969, the Ford Foundation contributed almost \$500,000 to help initiate the

Capital funds for the Amherst campus break down to \$2 million for books for the new library building, \$9 million for power plant and utilities, \$2 million for modular classrooms and offices, and \$310,000 for Phase II design of the graduate research center to provide space for mathematics and physics.

For the last fiscal year of 1970: Columbia Point, Boston, received \$50 million; Worcester received \$20 million in additional funds to cover cost increases; and Amherst received \$2 million for completion of the new library, \$600,000 for Tobin Hall psychology building, \$13.4 million for the fine arts building, \$1.2 million for the Infirmary addition, \$1.7 million for graduate research center equipment, and \$2 million for road work by the Department of Public Works.

CCEBS program, and has been asked by the CCEBS committee to continue its support for the coming academic year. The Ford Foundation is presently discussing with CCEBS the possibility of sending an evaluation team to UMass this fall to study the program. The Foundation has said that the program is the best of its type in the country, and it hopes the published results of the evaluation team's study may serve as a model for other universities to follow in designing similar programs of this type.

Dr. Bromery said that the bulk of the budget request for this year was needed for individual student grants which pay tuition, fees, room and board. The amount of each student grant is based on the individual student's need in accordance with the University's student scholarship policy.

The balance of the money requested in the budget was to support the approximately 60 graduate students who work half-time as tutors to the CCEBS students. Other costs include the coordination of the program by a staff of six professionals who are primarily concerned with guidance and counseling. The CCEBS staff is assisted by approximately 40 upperclass undergraduate CCEBS student volunteers who work in counseling the incoming CCEBS freshmen.

According to Bromery, "The University has submitted a supplemental budget request to the legislature so that the CCEBS program may continue to provide educational opportunities to these deserving students in the coming academic year."

Changes Due A. & S.

The College of Arts and Sciences at Amherst will be reorganized, by authorization of the Board of Trustees, into three divisions. A common college personnel office and business office will support the individual deans of each division — the Faculty of Humanities and Fine Arts, the Faculty of Social and Behavioral Sciences, and the Faculty of Natural Sciences and Mathematics. Curriculum for the 8,100 students involved is not changed by the reorganization.

ROTC Contract Negotiations Begin Soon

Negotiations for Army and Air Force ROTC contracts with the University will begin soon, and will include changes approved by the Board of Trustees.

Where now the rank of Assistant or Associate Professor is conferred upon all officer personnel except the senior officer, the Trustees call for the rank of Lecturer to be conferred instead. This would mean no change in pay for the military personnel, and the senior officer would retain the rank of Professor. (Ranks of Assistant and Associate Professor are called for in the present Air Force contract, but not in the Army contract; though they have been given to personnel in both branches.)

The second change would have the federal government reimburse the University of Massachusetts for full costs of the ROTC program. Under the present contracts, the University pays some secretarial salaries and contributes the use of space in Dickinson Hall, the ROTC building, built with state funds.

Though the Faculty Senate recommended to the Board of Trustees that the ROTC program be cut from four-year and two-year options to just a two-year program, the Trustees approved continuation of the option plan.

Regarding academic credit for ROTC courses, the Trustees made recommendations according to three categories of courses. These recommendations were:

"1. Courses with substantial 'academic area' content offered by the appropriate academic departments and taught by the regular faculty. These courses would carry academic credit and would be open to non-ROTC students also keeping in mind that the team-teaching concept should be employed whenever appropriate.

"2. Courses with diffuse 'academic area' (and also technical) content spanning several disciplines, and also courses concerned primarily with military tactics and strategy, and/or specialized military subjects. These courses would be offered by the members of the Division of Military and Air Science supplemented by cooperating faculty members of other departments of appropriate disciplines. Academic credit will be granted on the same basis and criteria as applied to all courses University-wide.

"3. Courses of indoctrination, and/or drill, and/or training in military skills, taught by military personnel and carrying no academic credit."

Chancellor Oswald Tippo, in a letter explaining the ROTC situation to the student newspaper, said that "in the interest of fair play, the courses to be taught by military personnel should have the opportunity to be considered for credit."

The Trustee guidelines for renegotiation provide that where Air Force or Army manuals are used for category 2 courses, the Military Affairs Subcommittee will review these manuals every third year "to ensure their suitability."

"Collegian"

Subscriptions Available

Parents wishing to subscribe to the University's student newspaper, "The Massachusetts Daily Collegian," may do so for \$10 a year or \$5.50 a semester. The "Collegian" prints five times a week, except during exam and holiday periods. Checks should be mailed to:

"The Massachusetts Daily Collegian"
Student Union Building
University of Massachusetts
Amherst, Mass. 01002

New Dorms Will Honor 3 Trustees

Three new residence halls at the University of Massachusetts at Amherst have been named for former University trustees, now deceased.

The Board of Trustees voted to name the new buildings in honor of Harry Dunlap Brown, William M. Cashin, and Elizabeth L. McNamara.

Harry Dunlap Brown of Hyannis served as a trustee from 1940 to 1968. He was graduated from Massachusetts Agricultural College in 1914 and was awarded an honorary doctor of laws degree from this University in 1964. He received the Distinguished Service Award from the Alumni Association in 1959 for his service as president and as a director of the Association. Mr. Brown was a director and clerk of the University of Massachusetts Building Association and had served the Commonwealth as a Representative in the General Court from 1929 to 1934.

William M. Cashin of Milton was appointed a University trustee in 1949 by Governor Paul Dever, and was reappointed in 1956 by Governor Christian Herter. He later served as one of the original trustee members of the University of Massachusetts Building Authority, and was a member until his death in July, 1969.

Mrs. Elizabeth L. McNamara of Cambridge served as a University trustee from 1937 until her death in January, 1957. From 1937 to 1947 she was chairman of the trustee committees on extension service, faculty and educational policy, experiment station, and horticulture. From 1948 to 1957 she served on the committees on legislation and faculty and educational policy.

The three residence halls, on Eastman Lane in the northeast area of the campus, are expected to be opened during 1971. Designed by John C. Warnecke and Associates of San Francisco and New York, they will house 1,400 students in suite-type accommodations.

Board Changes Core Curriculum

Three main areas of the required core curriculum were changed and three new courses of study established for the Amherst campus when the Trustees met Aug. 10.

The required year of literature in the Western tradition was dropped, the social and behavioral science requirement was simplified, and the mathematics and natural science requirement was reduced from 12 credit hours to nine.

An undergraduate major in comparative literature, a Ph.D. program in speech, and a major in computer systems engineering were established.

Student Tax Increased; Spending Guidelines Set

The student activity tax has been increased \$7 a year to \$36.50 for each student.

Board of Trustee approval of the Student Senate recommendation came Aug. 10. Also voted by the Board was a motion by Trustee Robert D. Gordon that expenditures of student tax funds be limited to activities on campus or "closely related" to campus.

The motion read: "...that funds for student activities collected by charges authorized by the Board of Trustees be expended for the support of activities on or closely related to the campus for which the charge is made and that no such funds be applied to donations of any kind to individuals or groups or organizations for activities off such campus or for the support of programs conducted off such campus, or be applied to support the candidacy of individuals seeking public office."

Authorized annually by vote of the Student Senate and approval of the Board of Trustees,

the student activity tax supports student government, and cultural and social activities for students. For the payment, students are entitled to admission to many campus events, and subscriptions to several student publications including a newspaper, "The Massachusetts Daily Collegian," and a yearbook, the "Index."

At least 32 student organizations will receive funds this school year, and more are eligible.

In a letter to the student summer newspaper, Chancellor Oswald Tippo questioned "forcing" undergraduates to pay tax for other programs: social action programs, especially off-campus; gifts and donations to off-campus people or organizations; and political activities which might pose questions in relation to Internal Revenue regulations and other Federal and state tax laws.

Though student bills were sent out with the student tax increase included, no money was spent for these categories until the Trustees resolved the matter.

College Planners Meet In Center

Among the 300 SCUP conferees were college and university executives and planning officers, architects, and engineers from all parts of the United States and abroad. Chancellor Oswald Tippo and the Board of Trustees gave a reception to honor architects who have designed

The newly opened Murray D. Lincoln Campus Center on the Amherst Campus hosted its first conference Aug. 9 through 12 when the Society for College and University Planning (SCUP) had its fifth annual meeting.

University buildings or assisted in the University's architectural planning.

The honored included: David Anderson, Herbert Beckhard, Pietro Belluschi, Marcel Breuer, John Clancy, Barry and Paul Coletti, John Dinkeloo, Vincent Kling, Per Nylén, Laurence Nulty, Kevin Roche, Hideo Sasaki, Edward Durell Stone, Hugh Stubbins, and John Carl Warnecke.

Major objective of the conference was to explore opportunities and problems of "Participation in Planning."

No Pre-Election Recess

There will be no eight-day class recess before the November elections, according to a vote of the University of Massachusetts Board of Trustees.

The recess, pioneered by Princeton University, was favored by some student and faculty members, and recommended by the Faculty Senate.

Trustees rejected the recess after hearing Chancellor Oswald Tippo list the pros and cons of the plan. He suggested a compromise plan which would allow students who wish to miss some school work to be involved in political work during the week preceding fall elections.

"During this period," he said, "we would hope to be able to persuade our professors not to require examinations or papers; and any work missed could be made up later." Chancellor Tippo also suggested that professors at the first meeting of a class state their intentions for that pre-election period — so that students may either participate in political activities or attend class during that time.

Reasons favoring the recess, as stated by Dr. Tippo, include: students could work within the system, students would cut classes anyway, students would get a good educational

experience from the political activity, and the plan was adopted by the Faculty Senate and faculty.

Reasons opposing the recess, again as stated by the Chancellor: 1. The make-up days for the eight-day recess would have included four reading days, two examination days, and three and a half Saturdays. This is not in keeping with guidelines of the American Council on Education, that non-curricular time should be used for make-up. 2. There would be criticism that faculty members were being paid for another vacation. 3. Non-academic employees of the University would demand time off. 4. Many students might not use the time for the political activity. 5. Students might not leave campus, but use it as a base for their political activity. 6. There have been threats of cutting University funds, for example by the Department of Health, Education and Welfare. 7. There would be criticism from parents, students, and the general public.

The Chancellor noted that only one state university — Rutgers — has accepted a political recess plan, and he noted that Harvard University had accepted a compromise plan where students may elect to do political work the week preceding elections.

September 19 Is Parents Day



Typical moment of excitement at Redmen game is seen in faces of these parents and students.

Rents Set

Rents for the 240-unit married student housing project are \$135 for single bedroom units and \$155 for two bedroom units. After the first three months of operation, when actual cost figures are available, the rent schedule will be reviewed. One-third of the units will be ready for occupancy in November.

The first football game of the 1970 Redmen season will be occasion for another first — Parents Day.

Parents are invited to the kick-off game between UMass and Maine Sept. 19 at Alumni Stadium on the Amherst campus. Arrangements for parents-student seating may be made with the UMass Ticket Office which will also gladly reserve overnight accommodations for parents requesting them.

Kick-off will be at 1 p.m.

Invitations are also extended parents for other special football weekends. Oct. 24 and Nov. 14 will be Homecoming games, the first sponsored by the Alumni Office and the second by the student body. UMass will meet Connecticut Oct. 24 and New Hampshire Nov. 14.

Office Of President Moving To Boston

President Robert C. Wood will move from temporary offices in Cambridge to offices in the Government Center, Boston, in September.

Institute Voted

An Institute of Governmental Services, voted by University Trustees, will help Massachusetts cities and towns solve problems.

The schedule of home and away games for the Redmen: Sept. 19, Maine, home; Sept. 26, Dartmouth, away; Oct. 3, Buffalo, away; Oct. 10, Boston University, home; Oct. 17, Rhode Island, away; Oct. 24, Connecticut, home; Oct. 31, Vermont, away; Nov. 7, Holy Cross, away; Nov. 14, New Hampshire, home; and Nov. 21, Boston College, home.

Ticket and other information regarding all games may be obtained by calling the Ticket Office at (413) 543-0810 or writing:

Walter R. Novak
Ticket Office
Boyden Building
University of Massachusetts
Amherst, Massachusetts 01002

President Wood Names Consultants

Three senior consultants have been named by President Robert C. Wood to advise him on the University of Massachusetts system.

The three are: Franklyn W. Phillips, regional administrator for NASA, who will be concerned with organization and finance; Albert Bush-Brown, vice president of the University of Buffalo, who will work on urban and regional planning; and Edward Lashman, president of Urban Associates of Denver, who will consult on development.

UNIVERSITY OF MASSACHUSETTS BULLETIN
AMHERST, MASSACHUSETTS 01002

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PARENTS NEWSLETTER
FOR PARENTS AND FRIENDS
OF THE UNIVERSITY

1970-1971

GENERAL INFORMATION BULLETIN

University of Massachusetts at Amherst



Table of Contents

BOARD OF TRUSTEES	2
A WORD FROM THE CHANCELLOR	3
ACADEMIC CALENDAR—1970-1971	5
GENERAL INFORMATION	7
ADMISSIONS	8
HOUSING	19
EXPENSES	25
STUDENT PERSONNEL SERVICES	31
HEALTH SERVICES	35
STUDENT ACTIVITIES	36
PLACEMENT AND FINANCIAL AID	45
GENERAL SERVICES ..	62
Overseas Study	68
The Graduate School	69
Summer Session	70
Five College Courses	72
SCHOOLS AND COLLEGES OF THE UNIVERSITY	73
College of Agriculture	75
College of Arts and Sciences	83
School of Business Administration	102
School of Education	104
School of Engineering	105
School of Home Economics	108
School of Nursing	110
School of Physical Education	111
Department of Public Health	114
Division of Military and Air Science	116
ADMINISTRATIVE OFFICERS	119

The Board of Trustees

Organization of 1970

Term Expires

JOSEPH P. HEALEY of Arlington	1977
FRANK L. BOYDEN of Deerfield	1974
ROBERT M. ABRAMS of Holyoke	1977
EDMUND J. CROCE of Worcester	1977
DENNIS M. CROWLEY of Boston	1973
ROBERT D. GORDON of Lincoln	1971
JOHN W. HAIGIS, JR. of Greenfield	1974
MRS. ELIOT S. KNOWLES of South Dartmouth	1974
LORENZO D. LAMBSON of Southwick	1973
LOUIS M. LYONS of Cambridge	1971
JOHN J. MAGINNIS of Worcester	1972
GLENN M. ELTERS '71 of Amherst	1971
GEORGE L. PUMPHRET of Dorchester	1974
MRS. GEORGE R. ROWLAND of Osterville	1972
ALAN SHALER of Easthampton	1977
MRS. O. PHILLIP SNOWDEN of Roxbury	1976
FREDERICK S. TROY of Boston	1970
CHRISTOPHER J. WELDON of Springfield	1976

Ex Officio

FRANCIS W. SARGENT of Dover, Governor of the Commonwealth
ROBERT C. WOOD of Lincoln, President of the University
NATHAN CHANDLER of Sterling Junction, Commissioner of Agriculture
ALFRED L. FRECHETTE, M.D. of Brookline, Commissioner of Public Health
MILTON GREENBLATT, M.D. of Newton, Commissioner of Mental Health
NEIL V. SULLIVAN of Cambridge, Commissioner of Education
NORMAN G. MACLEOD of Amherst, Chairman, Board of Selectmen

Officers of the Board

JOSEPH P. HEALEY of Arlington, Chairman
FRANK L. BOYDEN of Deerfield, Honorary Chairman
ROBERT J. MCCARTNEY of Amherst, Secretary
KENNETH W. JOHNSON of Amherst, Treasurer

A Word from the Chancellor



In this decade, with human potential, peril, and expectations greater than ever before, the best in education is becoming vital to growth, survival, and fulfillment for the individual and his world.

While social and material changes accelerate, so does the need for intellect, for process, and for reason.

This University is based on concepts of human dignity, intellectual freedom, and reasoned understanding. Our aim is to create a richly responsive community within which individuals may learn to become what they wish to be, while finding answers to each of their questions.

I hope that you will investigate the opportunity to become a part of this process at the University of Massachusetts.

A handwritten signature in dark ink, reading "Oswald Tippo". The signature is fluid and cursive, with a large initial "O" and a long, sweeping underline.

Oswald Tippo
Chancellor



Academic Calendar 1970-1971

(Adopted by Faculty Senate, March 20, 1969—Subject to Change)

First Semester

Tuesday	September	8	Graduate registration
Wednesday	September	9	Undergraduate registration
Thursday	September	10	Undergraduate course changes
Friday	September	11	Classes begin
Monday	October	12	Holiday
Saturday	October	31	Midterm marks close
Wednesday	November	11	Holiday
Wednesday	November	25	Thanksgiving recess begins after last class
Monday	November	30	Classes resume and counselling period begins (classes NOT suspended)
Tuesday	December	1	Thursday class schedule will be followed
Friday	December	4	Counselling period ends
Wednesday	December	23	Last day of classes; Christmas vacation begins after last class
Monday	January	4	Reading day
Tuesday	January	5	Reading day
Wednesday	January	6	Final examinations begin
Friday	January	15	Final examinations end

Second Semester

Tuesday	January	26	Graduate registration
Wednesday	January	27	Undergraduate registration
Thursday	January	28	Undergraduate course changes
Friday	January	29	Classes begin
Monday	February	15	Holiday
Friday	February	19	Monday class schedule will be followed
Saturday	March	20	Spring vacation begins after last class; mid-term marks close
Monday	March	29	Classes resume
Monday	April	19	Holiday
Monday	May	3	Counselling period begins (classes NOT suspended)
Friday	May	7	Counselling period ends
Monday	May	17	Last day of classes
Tuesday	May	18	Reading day
Wednesday	May	19	Reading day
Thursday	May	20	Final examinations begin
Saturday	May	29	Final examinations end
Sunday	May	30	Commencement



General Information

THE UNIVERSITY OF MASSACHUSETTS is the state university of the Commonwealth, founded in 1863 under provisions of the Morrill Land Grant Act passed by the United States Congress one year earlier. The University is a member of the great community of land grant colleges and state universities serving the nation as principal resources of higher education for the country's citizenry. Incorporated as Massachusetts Agricultural College in April, 1863, the institution was opened to a handful of students in 1867. Rooted in the liberal arts tradition (its early presidents were graduates of Dartmouth, Williams, Amherst, and Harvard), it has grown steadily from the four teachers and four wooden buildings available for its opening session. Reflecting the broadening interests of its students, the General Court of the Commonwealth of Massachusetts authorized a second name, Massachusetts State College, in April, 1931. Sixteen years later in May, 1947, the institution became the University of Massachusetts.

Situated in one of the most picturesque sections of the state, the University on its Amherst campus joins with its academic neighbors—Amherst, Smith, and Mount Holyoke Colleges—the newly-founded Hampshire College—in maintaining the rich tradition of educational and cultural activity associated with this beautiful Connecticut Valley region. The University's campus in Amherst consists of approximately 1,200 acres of land and 150 buildings. These structures include classroom and laboratory facilities as well as residence halls and other units.

To augment the Commonwealth's facilities at the university level, the University of Massachusetts at Boston was opened in September, 1965. The University at Boston offers educational programs comparable in quality to those available in Amherst. Day sessions, late-afternoon classes, and evening school, as well as full summer sessions all will eventually be offered in the new Boston program. The total resources of the University are dedicated to giving all qualified students full opportunities to develop their capabilities for service in a growing society.

The University's new Medical School at Worcester, founded in 1962 by an Act of the Legislature, will enroll its first class this fall.

Admissions

Applications for admission for the Amherst campus may be obtained by writing to the Admissions Office in Amherst. Applications for the Boston campus may be obtained by writing to the Admissions Office in Boston. See last page in this Bulletin.

WHEN TO FILE

High School seniors are advised to file their applications in the fall of their senior year. Unless applicants have superior records, they should not submit applications until the first set of marks are recorded in the fall.

DEADLINE DATES

Applications must be *received* and *complete* no later than:

In-State—March 1.

Out-of-State—February 1.

Foreign—February 1.

TESTS REQUIRED

The Scholastic Aptitude Test may be taken on any of the scheduled dates, although the December testing date is preferred. The March and May dates are too late for seniors, but are appropriate for juniors taking the test for guidance purposes.

Amherst campus applicants for admission are required to submit results of the Scholastic Aptitude Tests given by the College Entrance Examination Board. Although Achievement tests are not required, it is strongly recommended that all applicants submit three Achievement tests, one of which should be English Composition, the other two being the applicant's choice.

All Boston campus applicants must submit SAT's and three Achievement tests including English Composition.

All postgraduate and out-of-state students are required to submit SAT's and three Achievement tests including English Composition. Foreign students must submit either SAT's or TOEFL (Test of English as a Foreign Language).

ALL COLLEGE BOARD TEST REPORTS MUST BE SENT DIRECTLY TO THE UNIVERSITY FROM THE COLLEGE BOARD TESTING CENTER. Be certain that you request to have your scores sent to the campus to which you applied. Be certain to give the correct College Board number for your choice of campus. No action can be taken on an application until official scores have been received.

PREPARATORY STUDIES

The applicant's secondary school preparation must indicate the capacity to handle the quality of scholastic work which the University has established as its standard of achievement. A prerequisite for admission is the satisfactory



completion of a four year high school course or its equivalent. A minimum of sixteen units should be offered, distributed according to the following recommendations:

English	4
College Preparatory Mathematics	3*
Foreign Language (2 years of one language)	2
U.S. History	1
Laboratory Science	1

* Preferably two years of algebra and one of plane geometry.

The minimum of five other units should be offered in the areas of mathematics, science, foreign language, history and social studies, or free electives (not more than four units). These free electives afford the student the opportunity of electing other high school offerings, while at the same time covering the fundamental requirements of college preparatory work. Free electives might include, for example, music, art, typewriting, aeronautics, agriculture, home economics, etc. Students planning to major in physical sciences or mathematics should, if possible, offer two years of algebra, one of plane geometry, and one-half year of trigonometry. Preparation in analytical or solid geometry, chemistry, physics, and introductory calculus is also strongly recommended.



Students planning to pursue an engineering curriculum should offer two years of algebra, one of plane geometry, and one-half year each of trigonometry and solid geometry. Chemistry and physics are also advised. Those deficient in the mathematics requirements should plan to make it up during the summer prior to entrance or should expect to take five years to complete the college course.

Several of the University's schools and colleges do stipulate intermediate language proficiency as a graduation requirement. Students planning to major in these areas will find at least three years of secondary school language preparation advantageous. (See appropriate sections of this bulletin.)

Exceptional candidates whose secondary preparation is not within the framework of the above recommendations may be considered for admission. Their suitability for admission will be based on their other intellectual aptitudes and achievements and their readiness for the University curriculum.

TRANSFERS

A limited number of transfers are admitted on a competitive basis. Ratings are based upon high school and college records and on the College Board

Scholastic Aptitude Test, which is required of all transfers. Any student who has been previously enrolled in a college is considered a transfer and must file a transfer application form. Applicants for transfer should write to the Admissions Office for a transfer application. The University does consider for transfer only those applicants who have completed at least two years of satisfactory work at another institution. At least 45 semester credits taken in residence at the University are required of all transfers who are candidates for the bachelor's degree. Applications must be complete by April 1 for Fall and November 1 for Spring semester. Decisions are made late in the semester prior to proposed entrance.

CAMPUS VISITATIONS

Amherst: We recognize the importance of a first hand acquaintance with the colleges you may be considering, and we hope that you will find it possible to visit our campus for your own information and satisfaction. *An interview is, however, not part of the admission procedure.* It is physically impossible for the admissions staff to interview all applicants; therefore, personal conferences will be scheduled only if the candidate or his guidance counselor has a question which cannot be readily resolved by correspondence.

At the Amherst campus, group interviews are scheduled for in-state candidates at 10:00 a.m., and at 11:00 a.m. for non-residents on Saturdays, from September through December. Guided tours will be available at the conclusion of each group interview. Further tour information may be obtained by writing the University Guide Service at the Campus Center.

NOTIFICATIONS OF DECISIONS

In most cases applicants will be notified by mid-April of the action taken on their applications. Applicants who present strong academic records, enthusiastic school recommendations, and satisfactory College Board scores will receive earlier notification. This early notification should reassure the well-qualified applicant regarding college entrance and enable the student who has selected the University as his choice of college to settle his plans. Applicants accepted at an early date, however, are under no pressure to make a final decision in regard to their choice of college before the Candidate's Reply Date. In this way the burden of multiple applications on high school guidance counselors and college admissions officers may be lessened.

VETERANS APPLICATIONS

Veterans must submit a regular freshman or transfer application, whichever is appropriate, and submit results of Scholastic Aptitude Tests taken within the past two years.

VETERANS AFFAIRS

The veteran coordinator is a staff member of the Placement and Financial Aid Services Office. All University matters involving veterans affairs should clear through Placement and Financial Aid Services.

Eligible dependents of veterans who are entering the University for the first time should present a Certificate of Eligibility at registration. This may be obtained from the nearest Veterans Administration office. Board, room, and fees must be paid in advance whether the student is enrolled under the G.I. Bill or not.

Veterans' dependents who are transferring to the University from another institution or who have done summer work at another institution should present a supplemental Certificate of Eligibility at registration. This may be obtained through the veterans office at the institution last attended.

PHYSICAL EXAM

Physical examination by their personal physician is required of all entering freshmen, re-entering students and all students participating in athletics. Physical report forms for this examination will be mailed to each student with the bill for the first semester and must be completed and returned to the University Health Services 10 days before the opening of the semester. Evidence of a *successful* smallpox vaccination and active tetanus immunization are required.

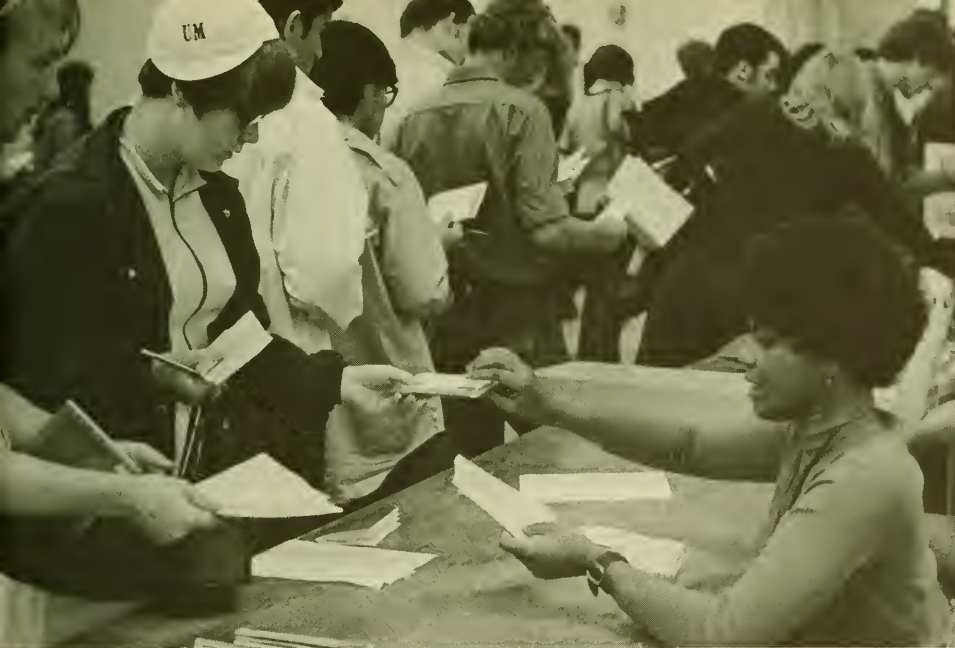
RESIDENCE STATUS

As a state institution the University offers a low rate of tuition to all students entering from the Commonwealth. Eligibility for admission under the low residential rate is determined in accordance with the following policy established by the Board of Trustees.

A student must present evidence satisfactory to the Treasurer of the University that his domicile is in the Commonwealth of Massachusetts in order to be considered eligible to register in the University as a resident student. This means that he must have established a "bona fide" residence in the Commonwealth with the intention of continuing to maintain it as such.

The domicile of a minor shall follow that of the parents unless such minor has been emancipated. In case of emancipation the student, in addition to the requirements of these regulations, respecting residence, shall present satisfactory proof respecting emancipation. Minors under guardianship shall be required to present, in addition to the certification of the domicile of the guardian, satisfactory documentary evidence of the appointment of the guardian. No student shall be considered to have gained residence by reason of his attendance in the University nor shall a student lose residential preference during his continuous attendance at the University. The residence of a wife shall follow that of the husband.

The prescribed form of application for classification as to residence status must be executed by each student. Misrepresentation of facts in order to evade the payment of out-of-state tuition shall be considered sufficient cause for suspension or permanent exclusion from the University. Discretion to adjust individual cases within the spirit of these rules is lodged with the Chancellor of the University.



ORIENTATION FEE

Members of the incoming freshman class attending the summer orientation program on the Amherst campus will pay a non-refundable fee of \$30 to cover the cost of meals, housing, testing and counseling. All incoming transfer students must attend a summer preregistration program on the Amherst campus. There is a \$15 non-refundable fee required of transfers to cover the costs of pre-registration, counseling, and lodging.

PAYMENT DUE DATES

In accordance with University policy, all charges for tuition, fees, board and room rent in University residences are due and payable approximately one month prior to the date of registration of each semester. Bills will be rendered in advance and payment may best be made by mail. Students may not register until all University charges are paid.

FRESHMAN ORIENTATION

All students entering as freshmen must attend a two-and-one-half-day orientation program at a specified time during the summer prior to entrance. The program consists of academic placement testing, counseling, and pre-registration for courses to be taken during the coming semester and orientation to social and academic opportunities available to undergraduates. Each student is assigned a faculty adviser who will help in the selection of courses and planning of a class schedule. On the final day of each of these periods, a special program is held for parents so that they may learn more about the University.



GRADING SYSTEM

Enrollment in and graduation from the University involve both quality and quantity of work. The quantity of work is measured by the credits obtained by successful completion of courses. The quality of work is measured by grades.

Each grade is equated with a quality point as noted below. The quality point average required for continued enrollment and for graduation is set by the Faculty Senate. At present the graduation requirement is a cumulative average of 1.80. Beginning with the Class of 1972, the cumulative average required for graduation is 2.0.

Grades are reported according to a letter system, as follows: A—Excellent, B—Good, C—Average, D—Passing (but not satisfactory), F—Failure, and Inc.—Incomplete, P—Pass, and indicates passing grade in special Pass-Fail Registration.

Quality points per semester hour are assigned as follows: A, 4; B, 3; C, 2; D, 1; F, 0 (P not included in computation of grade averages). To compute the semester grade point average, as well as the cumulative average, the total points earned are divided by the total credits carried.

In computing grade point averages the following will not be included:

1. Grades not earned at the University.
2. Courses satisfied by advanced placement.
3. A pass-fail course which has been successfully completed.

Any student whose semester quality point average falls below cumulative requirement is warned of his status by the Registrar and informed of the rules governing dismissal. Students who achieve high averages are placed in one of three honors groups each semester, as follows: First Honors: 3.8 or higher; Second Honors: 3.4 to 3.7 inclusive; and Third Honors: 3.0 to 3.3 inclusive.

Classification of Undergraduate Part-Time Students

1. DEGREE STUDENTS

FULL TIME STUDENTS

All students carrying 12 (freshmen, 11) or more credits must be accepted as degree candidates and assigned to a graduating class.

REDUCED LOAD STUDENTS

Full time students may obtain exemption from the minimum load requirements set by the Faculty Senate only upon approval of their academic dean based upon recommendation of the appropriate one of the following: Health Service, Area Coordinator, Office of Non-resident Student Affairs, or Counseling and Guidance Office. Such exemption is ordinarily not granted except upon the basis of health or critical personal or academic problems. A regular student may not enter the non-classified degree category, nor the Special Student category.

Reduced load students are considered as full time students, in *all* benefits, fees, and obligations. They continue in a class designation. The only exception made in their case is to the minimum load regulation. Although reduced load students carry less than the minimum load, the appropriate semester and cumulative quality point requirements for retention do apply and the semester counts as one of the ten toward graduation. Reduced load students bear a regular Student I.D. card.

NON-CLASSIFIED DEGREE STUDENTS

Students who are admitted to degree status on the same basis as full time students, but with the expectation of only part-time pursuit of the degree are considered *Non-Classified Students*. They are given a classification of "NC." For their initial enrollment they are processed as incoming freshmen or transfer students. They are assigned to a major department, to provide appropriate counseling and pre-registration advising.

Non-Classified students are not entitled to student benefits, other than departmental support. They are billed by the credit with other fees assessed only as appropriate to Special Students (below). At pre-registration a special billing card is filled out by student and adviser. To be eligible for continued enrollment, Non-Classified students must maintain a cumulative average equal to the graduation average of the University. They bear a Special Student I.D. card.

The category "Non-Classified" is an original admissions category and is not designed as a category into which full time students may revert for purposes of part-time study.

2. NON-DEGREE STUDENTS

SPECIAL STUDENTS

A transient student accepted for one or two courses on a *non-continuing* basis is assigned to this category (Class designation "SP"). No evaluation of transfer credentials or course advising is offered to students in this category

nor are they entitled to any student benefits. Their continuance is not automatic, but at the discretion of the appropriate admissions officer. A minimum of the graduation average of the University would be required for an "SP" to continue. They bear a Special Student I.D. card. The Special Student category is an original admissions category and is not intended as a category into which full time students may revert for purposes of part-time study.

ADVISORY SYSTEM

All freshmen select a tentative educational objective and are assigned a faculty adviser within that academic area.

In the second semester of the freshman year, each student is given an opportunity to change to a new department or to remain in his current department. In succeeding semesters, students may change to another major department by execution of a Major Change Card (available in the Registrar's Office).

It is the function of his adviser to help the student in adjusting himself to the work and life of the University. Academic progress reports issued by the Registrar's Office are sent to the advisers periodically, and the students are expected to report to their advisers from time to time to discuss their academic standing.

The University also forwards reports of academic standing to the parents. Both students and parents are encouraged to consult with the adviser whenever there are problems regarding studies or personal adjustments to college life.

SUPERIOR STUDENTS

The University regularly provides superior students with challenging educational programs extending from the freshman through the senior year. These include Advanced Placement and Special Honors Programs.

Many entering students are able to achieve advanced standing and credit for college-level courses successfully completed in their secondary schools as part of the College Entrance Examination Board Advanced Placement Program or an equivalent. The University also administers a number of its own advanced placement tests. A student who demonstrates he is proficient in a basic college subject may bypass the beginning course and go on to advanced work in the subject. Also, up to thirty semester hours of credit may be granted students of high standing who can fulfill the requirements of some of their courses through independent study.

The College Honors Program provides special guidance and courses for students of superior ability. Students are selected for the program as freshmen or sophomores. The Senior Honors Program recognizes merit and gives highly qualified students time and opportunity for independent study under closer, more personal direction than is ordinarily provided in the University curriculum. Students who complete their work satisfactorily are eligible for graduation with honors.



GUIDED TOURS

Through the University Guide Service, ARCON, guided tours are available during the regular academic year on weekdays from 1:30 to 3:30 p.m., Saturdays from 9:00 a.m. to 12:30 p.m., and Sundays from 1:00 to 3:00 p.m.

MOTOR VEHICLE REGULATIONS

All student, faculty and staff motor vehicles must be registered with the Parking Office, Hampshire House, Room 105.

All students may be permitted to have a motor vehicle on campus provided it is registered with the Parking Office, and complies with published University regulations.

Copies of the University regulations concerning motor vehicles should be obtained at the Parking Office, Hampshire House, Room 105.

All vehicles not registered with the Parking Office, except bona fide visitors, are in violation of University rules and regulations and are subject to ticketing.

Parking citations must be settled according to the instructions on the ticket or parking privileges may be revoked.

Registration cards incorrectly filled out may result in revocation of the privilege of having a vehicle on campus.



Student Housing Policy

The Amherst campus is oriented to a program that recognizes the educational advantages of both classroom instruction and extracurricular experiences. Residence hall living provides valuable exposure in this regard. Consistent with this philosophy, it is the policy of the Board of Trustees to require undergraduates to be housed in University residence halls.

EXEMPTIONS

Exemptions from this policy are married students, members of fraternities and sororities having authorization within approved maximum capacities for their houses, and students commuting from the home of their parents or spouse. Students who are living in University residences seek permission to live off campus by submitting a request to the appropriate Area Coordinator. Others forward a similar request to the Office of Nonresident Student Affairs before they appear on campus for their first registration.

ROOM ASSIGNMENTS

Residence halls are opened to sophomores, juniors, and seniors on the day before registration. Upperclass students have the opportunity to select rooms in the Spring of the preceding year. Rooms are assigned in order of receipt of proper application. Notification of assignment is made on the fall semester bill mailed in July.

Freshmen will be notified three to five days before registration when to arrive on campus to participate in Freshman Week activities. An effort is made to assign freshmen roommates from different geographical areas who have similar interests.

HOUSING PLANS

The University recognizes the desirability of providing a variety of living arrangements, and toward fulfillment of this goal offers three basic systems: Residential colleges, the so-called "traditional" residence halls, and new suite or apartment-style residence halls to be opened in the Spring of 1971. All three programs offer opportunities for intellectual, cultural, and social activities, and all three include some coeducational units, in which the sexes are segregated by floors or wings.

Residence halls, dining facilities and other projects constructed by the University of Massachusetts Building Authority are self-amortizing by the collection of rents and student fees. Such facilities are constructed at no cost to the taxpayers.

There are fifty-one residence halls at the University. They are divided into the following grouping: The Northeast Residence Area (traditional); the Orchard Hill Residential College; the Central Residence Area (composed

of the remaining "traditional" residence halls); the Southwest Residence Area, which is the Southwest Residential College; and the new Sylvan Residential Area which will offer the suite-style living (planned to open by Spring, 1971).

"Traditional" residence halls function as individual, student-organized units. The Central and Northeast Residence Areas consist of twenty-one residence units housing 4,000 students. Occupancy of halls varies from 118 to 332. Most rooms are designed for double occupancy although some are triples. A few singles are available to counselors and upperclassmen. A "traditional" residence hall is a house with a long standing tradition of fellowship, unity and loyalty; a personalized tradition, differing with each residence. The "traditional" hall, by its very nature, provides opportunity for meaningful friendship in a relaxed atmosphere.

The Orchard Hill Residential College represents a planned and conscious emphasis in student residences, which is to make these residences more private, more quiet and more academic in tone than is generally true of large residential units. Each of the units within the college has student personnel and faculty as advisers. These advisers provide cultural as well as academic participation in the units and coordinate the collegiate aspect of the academic program. Approximately 1,300 students live in this area consisting of two men's and two women's residence halls.

The Southwest Residential College operates on the assumption that a "college" within a university may function to provide more effective small group identities and a maximum of contact by the students and members of the faculty. Special sections of selected courses are designated for residents of both residential colleges. Music and dramatic events, special lectures and discussions take place in residence halls. Faculty Fellows of the college and students participate equally in the planning of these. Students of the colleges are welcome to participate in as many of these activities as they find to their advantage. The Southwest Residential College comprises 5,500 students in both high-rise and low-rise buildings.

The new suite-type dormitories will afford students an opportunity to build a close living relationship within a small group by sharing quarters in a suite or apartment-type arrangement.

Most residence hall rooms are provided with basic furniture which includes beds, mattresses and mattress covers, dressers, desks, desk chairs, closets and mirrors. Fireproof lamps and wastebaskets are provided in about half of the University's residence halls. Where they do not exist students are expected to provide their own. In addition to this, most residence halls have study lounges, kitchenettes, laundry facilities and vending machines. The residence halls within the residential colleges are also provided with window draperies and lounge chairs.

Each student is expected to provide his own pillow, linen and blankets. However, there is a local rental service which can supply a weekly change of bed linen and towels; blankets and a pillow may also be rented.

Certain residence halls are equipped with room telephones. Students who



elect to reside in these residence halls will be charged an additional fee per semester for the basic telephone service.

Students are urged to bring a minimum of personal effects; it is also advisable for them to wait until they see their accommodations before adding to their wardrobes.

RESIDENCE HALL STAFF—AREA COORDINATORS

Each residence area is administered by an Area Coordinator, who is responsible to an Assistant Dean of Students. All staff personnel in a residence hall report to the respective Area Coordinator. Area Coordinators plan and direct all student personnel administrative activities for the residence halls in a given campus residential area; supervise the professional staff and student assistants in the residence halls; advise elected officers and committee chairmen in the residence halls; provide individual and group advising; perform related work as required or as may be assigned by the Assistant Dean of Students. They report directly to the Associate Dean of Students.

HEADS OF RESIDENCE—RESIDENCE DIRECTORS

The Heads of Residence and Residence Directors are responsible to the Area Coordinators. They work jointly with the counselors and Housing Office in the operation of residence halls. They provide leadership and support to the residence hall staff; facilitate the work of elected house government officers and committee chairmen, serving as resource persons and discussing University expectations with them; provide individual and group advisement out of concern for the welfare of students within the residence halls; and carry out administrative responsibilities associated with the operational aspects of residence halls.

COUNSELORS

Counselors receive direct supervision from the Heads of Residence and receive general supervision from the Area Coordinator. Their duties include: helping to establish, in the residence halls, a climate in which students will feel free to seek assistance and in which the educational goals of the University are emphasized; providing individual students with advice and counsel with respect to personal, social and academic matters; working jointly with the Heads of Residence and house government in providing for the daily operation of the residence hall; interpreting and maintaining regulations with respect to student life on campus; and assisting the Head of Residence with administrative tasks in the residence halls.

ROOM RENT

It is Board of Trustees' policy that "charges established . . . shall not be refundable to a student after he has occupied his assigned accommodation except upon certification of the Dean of Students that such student has withdrawn from the University because of involuntary entry into military service or other reason of extreme emergency, the refund in such event to be the balance of the charge paid over that applicable to the period of actual occupancy plus one week." Further information, for which students are held responsible, is contained in the *Student Handbook*.

Residence halls are constructed, equipped, and maintained at no cost to the taxpayers through funding provided by bonds issued by the University of Massachusetts Building Authority. Room rents are fixed so as to provide a fund sufficient to pay building and operating costs—i.e., to amortize the bonds. In order to meet payments on the various residence hall bond issues and to assure the minimum possible room rent, maximum occupancy must be maintained. (The fewer students who pay room rent, the more every student ultimately must pay to meet the fixed indebtedness to pay off the bondholders.) This requires that a student be held financially responsible for room rent once registering for and occupying a room in a residence hall.

The fee for most "traditional" University residence halls is \$250 per student per semester. Students choosing to live in one of the residential colleges pay a fee of \$280. (There are rooms in a few University residence halls available at \$280 which are not included under the residential college program.) Students who choose to live in the new suite-type dormitories in the Spring Semester will pay \$325.

ROOM SECURITY DEPOSIT

Students who are required to live in University residence halls must pay a \$100 room security deposit over and above the regular room rent. The deposit shall be paid upon initial entrance to the University and shall be refunded as follows:

- a. upon graduation from the University;
- b. upon voluntary withdrawal from the University, release of assigned

housing, or intention not to re-register filed in writing with the Registrar provided such notice is filed *45 days prior to the registration date of the next semester*;

- c. upon involuntary call into military service; or
- d. upon academic dismissal from the University.

A student forfeits the deposit if, having reserved housing, he or she does not occupy it, unless written notice in accordance with regulation on voluntary withdrawal (above) has been given and accepted, or upon dismissal from the University for disciplinary reasons.



APARTMENTS FOR MARRIED STUDENTS

The University owns and operates three groups of apartments for faculty, married graduate and married undergraduate students; University Apartments, Lincoln Apartments and North Amherst ("modular") Apartments. As they become available, these apartments are offered to applicants according to a predetermined order of priority and assignment procedure. It is suggested that married students apply for Lincoln Apartments and North Amherst Apartments as soon as possible. Due to many previously received applications, however, it may be unlikely that an apartment can be assigned by the desired occupancy date. Applications and specific information may be obtained from the Off-Campus Housing Office, Whitmore Administration Building.

OFF-CAMPUS HOUSING

A card file of off-campus house, apartment, and room rentals is maintained by the Off-Campus Housing Office. Also provided is information about local realtors, garden apartments developments, classified newspaper rentals, and persons seeking roommates. Every effort is made to assist students to obtain off-campus housing. However, a personal visit is usually necessary to review rental listings due to daily changes in the card file and the fact that all off-



campus arrangements must be made by the parties involved. Brochures and other information may be obtained from the Off-Campus Housing Office, Whitmore Administration Building.

INSURANCE

It is not possible for the University to carry insurance which will compensate students or their families for losses suffered on the campus due to such hazards as fire, theft or water damage. For most families such insurance is highly desirable, either as an extension of present home insurance or as a special contract.

FOOD SERVICES

The University Food Services caters the food requirements of the University, except those services offered by the Campus Center Complex. Five dining commons serve students on a five-day meal ticket contract. All freshmen, sophomores, and juniors residing in University residence halls are required to purchase the five-day meal ticket. In addition, all students including seniors living in the Southwest Residential College are required to subscribe to the board plan. Students over 21 years old, prior to the start of the semester, are exempt from the plan, other than those living in the Southwest Residential College. Students who are members of fraternities or sororities may be permitted to board at their respective fraternities or sororities, upon receiving written permission from their respective student personnel deans. Those not required to board on campus may eat at dining commons on a cash basis. Board entitles the student to fifteen meals per week, three meals per day, Monday through Friday.

Snack bar services are available at Worcester Commons, Greenough residence and Hampden Dining Commons during regular hours of operation.

Expenses

AMHERST CAMPUS

Expenses vary from approximately \$1,700 to \$1,800 per year for the normally economical student. First-year costs are usually greater than those of the other three years and there is less opportunity for earnings. Therefore, a student is advised to have a definite plan for meeting the expenses of the first year before entering. The following estimate of a year's expenses, based chiefly upon last year's costs, includes only those items which are strictly University-related and does not include amounts for clothing, laundry, travel, etc. These costs vary slightly from year to year. Tuition for residents of Massachusetts is \$200 per year and for others \$600. The University reserves the right to change any fees without advance notice.



ESTIMATED ANNUAL EXPENSES—AMHERST

Tuition (residents of Massachusetts)	\$ 200.00
Room rent in University residence halls	560.00
Telephone (where available)	25.00
Board at University dining halls (five-day plan)	530.00
Athletic Fee	30.00
Physical Education Equipment Fee	10.00
Student Union Fee	48.00
Fine Arts Fee	6.00
Student Activities Tax (approx.)	40.00
Student Health Service Fee	70.00
Student Medical/Surgical Insurance, 12 months' coverage (optional)	27.00
Books, stationery, laboratory and other supplies (approx.)	200.00
Estimated total	\$1,746.00

INITIAL PAYMENT FOR FRESHMEN—AMHERST

Tuition (residents of Massachusetts)	\$ 100.00
Room rent in University residence halls	280.00
Telephone (where available)	12.50
Board at University dining halls (five-day plan)	265.00
Athletic Fee	15.00
Physical Education Equipment fee	10.00
Student Union Fee	24.00
Fine Arts Fee	3.00
Student Activities Fee (approx.)	20.00
Student Health Service Fee	35.00
Student Medical/Surgical Insurance	
12 months' coverage (optional)	27.00
Books, stationery, laboratory and other	
supplies (approx.)	100.00

Estimated total \$ 891.50

These are only approximate figures. A bill will be rendered to the parent of each student prior to the beginning of the semester.

BOSTON CAMPUS

The direct costs involved in attending the University of Massachusetts at Boston are appreciably lower than those for attending the University of Massachusetts at Amherst. Major difference is the cost for room and board; since the University of Massachusetts at Boston was created as a non-residential college, its students live and board at home or under non-college arrangements.

Certain other expenses which are obligatory at the University of Massachusetts at Amherst are not required for the University of Massachusetts at Boston students.

The following schedule of tuition and fees includes only those items which are strictly college-related and does not include amounts for clothing, laundry, travel, etc.

Expenditure for books, stationery, and other supplies is estimated to be \$100 for all full-time students.

SCHEDULE OF TUITION AND FEES—BOSTON

	<i>Full-time</i>	<i>Part-time</i>
Tuition (residents of Massachusetts)	\$200	\$100
Tuition (non-residents)	600	300
Student Activities Fee	30	20
Student Medical/Surgical Insurance,		
12 months' coverage (optional)	30	30
Student Health Fee	24	12

The initial payment for first semester expenses, required of freshmen at

the time of fall registration, is \$157 for students who are legal residents of Massachusetts and \$357 for non-resident students.

TUITION

As a state institution, the University offers the privilege of in-state tuition to all students entering from the Commonwealth. Eligibility for admission under the low residential rate is determined in accordance with the following policy established by the University.

1. A student must present evidence satisfactory to the Treasurer of the University that his domicile is in the Commonwealth in order to be considered eligible to register in the University as a resident student. He must also have established a bona fide residence in the Commonwealth for a period of not less than one continuous year prior to the date of acceptance at the University, and certify his intention to continue to maintain such a residence.

2. The domicile and residence of a minor shall follow that of the parents unless such minor has been emancipated. In case of emancipation, the student in addition to the requirements of these regulations respecting domicile and residence shall present satisfactory proof respecting emancipation. Minors under guardianship shall be required to present in addition to the certification of domicile and residence satisfactory documentary evidence of the appointment of the guardian.

3. No student shall be considered to have gained residence by reason of his attendance in the University nor shall a student lose residential preference during his continuous attendance at the University unless he ceases to be a citizen of the Commonwealth.

4. The domicile and residence of a wife shall follow that of the husband.

5. This form of certification for classification as to domicile and residence status must be submitted by each student. Misrepresentation of facts in order to evade the payment of out-of-state tuition shall be considered sufficient cause for suspension or permanent exclusion from the University.

6. Discretion to adjust individual cases within the spirit of these rules is lodged with the President of the University.

TELEPHONE

Students electing to live in residence halls with room telephones will pay an additional service charge for local telephone service. Toll charges will be billed directly by the New England Telephone Company. Freshmen assigned to facilities with room telephones may request reassignment and such requests will be accommodated space permitting.

OTHER FEES AND PAYMENTS

Athletic Fee

Funds received from this charge are used to support comprehensive men's and women's intercollegiate programs as well as intramural programs.



Physical Education Equipment Fee

Income from this fee is used for the purchase of all clothing issued to students for use in the required physical education program, intramural athletics and general recreation.

Student Union Fee

Funds received from this charge are used to support the Student Union and the Campus Center and meet the operating costs of their various activities. A description of Student Union facilities and activities appear on page 36.

Fine Arts Fee

Funds received from this fee are used to support a varied and comprehensive program of fine arts events for the cultural enrichment and enjoyment of the undergraduate body.

Student Activity Tax

This tax, collected by the University, is authorized annually by vote of the Student Senate and approved by the Board of Trustees. It supports student government, and an extensive and varied range of cultural and social activities

for students. In addition, payment entitles each student to admission to many campus events, and includes a subscription to the daily student newspaper, the annual yearbook, the student handbook, and a student guide to the campus.

Health Services Fee

Funds received from this charge are used to support the medical, psychiatric, and health services provided by the staff of the Infirmary.

Medical-Surgical Insurance

This is an *optional* plan intended to supplement the care received by students at the Infirmary. It provides hospital, medical and surgical care on a twelve-month basis for injuries or illness during the school year, holidays, summer vacation and other times when the student is off campus. Students who register for the fall semester have only *one opportunity* to enter or reject this program each year, at the time of payment of the fall semester bill. It is also offered on the spring semester bill for new spring registrants only. Married students desiring family coverage under the plan now in existence at the University are advised to contact the Student Health Services. All candidates for and members of intercollegiate athletic teams *are required* by the Athletic Department to subscribe to the supplementary insurance plan.

Commencement Fee

A commencement fee of \$10 will be assessed students in September of their senior year, as commencement exercises and events are intended to be self-supporting.

Special Undergraduate Students

The Special Student tuition rate is \$10 per credit for Massachusetts residents, up to a maximum of \$100, and \$30 per credit for non-residents, up to a maximum of \$300. All students must pay a \$1 identification card fee yearly, and students taking three or more *courses* a semester must pay a Student Union fee and a health fee.

Payment Due Dates

In accordance with University policy, all charges for tuition, fees, board and room rent in University Residence Halls are due and payable prior to the date of registration of each semester. Bills will be rendered in advance with due date shown and payment may best be made by mail. Students may not register until all University charges are paid.

Scholarship Payments

It is the responsibility of all scholarship holders to see that the University is adequately notified prior to the time fee bills are prepared. Known scholarships are shown on the fee bills. If such items are not shown, deductions may not be made from the bill until satisfactory evidence has been presented to the cashier's office by the recipient.

Late Payment and Registration

Any student who does not make payment of his semester charges by the date specified may be required to pay a late payment fee of \$5. The process of

completing arrangements for housing and board according to schedules set forth by the University is to be considered a part of general registration procedures.

Credit by Special Examination

Students receiving credit by special examination must pay \$5 per credit before the examination may be taken. This fee is non-refundable.

REFUNDS

Tuition and Fee Refunds

A student who leaves the University for any reason, except as specified below, before a semester is completed will be granted a pro rata refund of tuition and fees. A student who makes an advance payment and then for any reason does not attend any part of the next semester or term at the University will be given a full refund of tuition and fees. The \$15 matriculation payment required of new students is not refundable. A student who is involuntarily called into military service before the completion of a semester will be given a pro rata refund of tuition and fees provided that he receives no academic credit for the work of that semester. If academic credit is given, there will be no refund.

Refunds are first applied to reimburse scholarship or loan funds (up to the full amount), and any remaining amount is refunded to the student or parent.

A student who is suspended or expelled from the University for disciplinary reasons forfeits all rights to a refund.

Refund Schedule

Regular Term

- a. Within the first two weeks from the beginning of semester or term—(Registration Day)—80%.
- b. During the third week—60%.
- c. During the fourth week—40%.
- d. During the fifth week—20%.
- e. After the fifth week—no refund.

Summer Session

- a. During the first week—60%.
- b. During the second week—20%.
- c. After the second week—no refund.

Room Rent and Board Refunds

There will be no refund of prepaid room rent after the semester has begun. A student who has made an advance payment of room rent will be granted a full refund of prepaid room rent if he fails to attend any part of the next semester or term or does not reside in a residence hall or other housing. Students involuntarily called to military service may be granted a refund on a prorata basis. Prepaid board will be refunded on a special per diem basis.



Student Personnel Services

Student Personnel Services comprise the administrative agencies with primary concern and responsibility for students and student services outside the classroom.

The Dean of Students directs and supervises the activities of all Student Personnel Services in order that they might serve most effectively to meet the broad educational goals of the University.

The Associate Dean of Students is responsible for the general administration of all residence halls and the activities program of men and women undergraduates. The Associate Dean's Office includes in its staff grouping the Housing Office, Coordinator of Student Activities, Campus Center Manager, the Area Coordinators and all Heads of Residence.



The University's 51 residence halls are subdivided into four areas. Each area is administered by one or more Area Coordinator. (All Heads of Residence in an area report to the Area Coordinator.) The Area Coordinators report to the *Assistant Deans of Students* on the Associate Dean's staff.

Area Coordinators plan and direct all student personnel administrative functions for residence halls within a residential area, supervise and counsel the staff and student assistants in the area, advise elected officers and committee chairmen in their residence halls, provide individual and group counseling, and perform related services as may be assigned by the Associate Dean.

The Assistant Dean of Students—Coordinator of Student Activities administers and coordinates all student activities ranging from individual needs to organized clubs, the Classes, the Campus Center Governing Board and the Student Senate. The base of operation is the Student Activities Office in the Campus Center which is composed of Recognized Student Organizations (R.S.O.) financial and accounting service and the Program Office whose personnel advise and assist in the planning and execution of student projects and programs.

The Office of Non-resident Student Affairs is responsible for administrative liaison with and development of programs for non-resident students—commuters, fraternity residents, and sorority residents.

The Dean of Women serves off-campus women students, including sorority residents and provides academic counseling for married women students. She serves as adviser and administrative liaison for women's organizations, Alpha

Lambda Delta, Mortar Board and Scrolls, and for the Faculty Women's Caucus and Committee on the Status of Women. The office also has short-term emergency loans and information on special loans and fellowships for women.

The Housing Office has responsibility for the supervision of residence hall room assignment, room changes, and serves as a central source of information for off-campus housing listings.

The Campus Center Manager administers and coordinates the management policies for the Student Union-Campus Center. The duties include close coordination with the Campus Center Governing Board, serving on various committees concerned with student services and supervision of the Campus Center staff and services. Major areas of responsibility include the University Store, Campus Center Food Services, University Conference Office, Student Union Lobby and Games Area, Campus Center overnight accommodations, Parking Garage, Print Shop, Continuing Education activities conducted in the Complex, and all additional services contained in the Campus Center Complex.

The Director of International Programs, reporting to the Office of the Provost, assists and coordinates international programs, including the study abroad programs of the University of Massachusetts. Students can obtain information from the Office of International Programs on a range of overseas study programs, including those operated by other American colleges and universities and by foreign institutions. This office also has information on low-cost international travel, international student identity cards, and work opportunities overseas. Students planning to go abroad for work, study, or travel should consult the Director in making these plans. The Director also coordinates Marshall and Rhodes Scholarships.

The Foreign Student Adviser offers assistance to foreign students, faculty and staff, and should be consulted in regard to all matters pertaining to their official immigration status while in the United States. In addition, the adviser may be consulted regarding any other problems which a person from another country may encounter while at the University. These questions may include help in finding housing, help with financial matters including the authorization of foreign student loans, relations with American students and the community, and personal problems. An attempt is also made to help in coordinating community service projects, such as speaking engagements, trips to the United Nations, etc., host families and International Club activities. The Foreign Student Adviser reports to the Director of International Programs.

The Admissions Office is responsible for all administrative procedures with respect to undergraduate admissions to the University including liaison with high school guidance counselors, Community College staff personnel and other admissions officers for transfer students; passes on readmission of returning and reentering students, and sets admissions standards in coordination with the Provost and academic departments. The admissions deans also serve as advisers to the various academic year classes.

The Registrar's Office is responsible for registration (enrollment) and matriculation of undergraduate students at the University, administrative procedures relating to course loads (adding and dropping courses), section changes, course of study, withdrawals, producing grade reports, transcripts, and maintaining the permanent academic report cards.

The Counseling Center's basic aim is to support the student's efforts to develop into a mature, useful, self-fulfilled member of society. The Center's day-to-day work with the student-client involves psychological counseling on personal, social, educational and vocational problems.

All individual counseling contacts with members of the Counseling Center staff are strictly confidential. No information is released to members of the University community, to parents or to outside agencies (such as graduate schools, law enforcement agencies, or draft boards) without the student's explicit authorization in advance. When the need arises, the Counseling Center staff also administers psychological tests for assessing students' abilities, interests, and personalities. Such tests are interpreted to students as part of the counseling process.

The Office of Placement and Financial Aid Services' responsibilities include vocational and financial counseling and the administration of the affairs involved in aiding students to seek appropriate positions and careers; the granting of and information concerning loans and scholarships, including the various federally sponsored financial aid programs; the assignment of part-time work; the coordination of veterans' affairs; and the dissemination of information relative to military service. While providing vocational and career counseling for all undergraduates, the emphasis is on aid to seniors in planning their future following graduation and providing them with the best means for finding permanent employment. The office arranges for employers from business, industry, schools, and other areas to visit the campus to interview prospective graduates during the school year.

Cumulative student personnel records, occupational information and industrial literature libraries, preparation of credentials including personal resumes and recommendations, coupled with counseling and guidance, are provided to aid seniors and registered graduates in accomplishing their career objectives.

Health Services

The University Health Services provide guidance for the development of optimum physical, emotional, and social welfare in the University community. Most of its resources are directed toward providing health care for students. It has an active concern for matters of environmental health and safety affecting the welfare of students, faculty, employees, and visitors.

The center of activities is the Infirmary. Here are located an outpatient department, with supporting X-ray, laboratory, and physical therapy facilities, and eighty beds for the care of students who need hospitalization.

Recognition of the specific emotional needs of students in an educational environment has led to the provision of an active mental health program including diagnostic and limited treatment services. Orthopedic services can be arranged as the need arises. Hospitalization for conditions requiring more specialized care than is available in the Infirmary can be arranged at the Cooley Dickinson Hospital in Northampton.

Any care rendered on the campus by members of the staff of the Health Services is provided without additional charge to those who have paid the student health fee. The provision for care off campus can be arranged by the Health Services, but the cost of this care is a responsibility of the student. A supplementary insurance program has been developed to provide for most hospital and surgical care not available at the Infirmary. This optional program is available in September only. The insurance provides coverage until the following August 31.

All candidates for and members of intercollegiate athletic teams are required to subscribe to this supplementary insurance plan.

The Health Services work closely with the School of Physical Education in adapting the facilities of the School to the individual needs of students for restricted or remedial activity. The health status of participants in the athletic program, both intramural and intercollegiate, is under Health Services supervision; and care is available for injuries resulting from these activities.

Students are urged to consult a member of the Health Services staff as soon as any indication of a physical or emotional disorder is evident. It is much easier for the staff, and less time-consuming for the student, to rectify minor difficulties before they have become sources of disability.

Students who are under medical supervision prior to entrance are urged to have their physicians write the Health Services, giving reports and instructions in appropriate detail. In brief, the Health Services attempt to provide all students with a coordinated and comprehensive program of health supervision formerly provided by their family physicians.

All visits and information gained as a result of visits to the Health Services are treated as confidential and no such information will be released without the express permission of the student.



Student Activities

THE CAMPUS CENTER COMPLEX

The Campus Center Complex is composed of the new Murray D. Lincoln Campus Center building, the Parking Garage and the Student Union. It houses the offices of the Assistant Dean of Students and his Student Activities staff and the Campus Center manager and his staff. The Activities staff provides services in programming activities and maintaining and accounting various student funds. Service departments of the Center include: the University Store which carries a complete stock of books and sundry supplies; Food Service which provides snacks, lunches, and catered meals; Games Area; Cashiers Office; Post Office; Ticket Office; and Barber Shop. The Lobby Counter, the campus information center, includes a sundry counter, night and weekend check-cashing service, coat checking, record library, lost and found, and room scheduling. Lounges, meeting rooms, reading rooms, art galleries, music listening booths, etc., are available for student and general campus use.

The Campus Center Governing Board, which is comprised of undergraduate and graduate students, alumni, faculty and staff, determines policy for the operation of the Center. A standing committee of the Board, the Program Council, which is composed wholly of students, selects, plans and executes all Center activities in art, music, dance, movie, special events, etc. Any student may apply for membership on the Council.

Construction and operating costs of the Center are met from student fees and income generated from general operation, particularly the Food Service Department, the University Store, the Conference Department and Continuing Education Department. The Conference Department and the Continuing Education Department are important contributors to general income since a fee is paid to the Campus Center for each person attending sessions. Extra income is generated in the University Store, Food Services, overnight accommodations, garage and facilities usage.

STUDENT ACTIVITIES OFFICE

The Student Activities Office in the Campus Center is the headquarters for Recognized Student Organizations (R.S.O.) and the Program Office. It provides a banking, bookkeeping, and auditing service for student organizations, as well as resources and counsel on program planning, budgeting, purchasing, contracting, and most other aspects of the affairs of student organizations. Advisers are available to work closely with students and faculty advisers of student organizations to help them attain their goals and best serve the University. Detailed information may be obtained by contacting the Student Activities Office.

Participation in extracurricular activities offers opportunities to further the broader objectives of a college experience. The knowledge, skills, and judgment developed in the classroom can be tested and refined through use in the organizational setting. More than fifty "professional" clubs exist on campus as a means of extending classroom interest through closer contact with members of the teaching staff and representatives of the professions. Student government offers a forum for debate on matters of importance to the entire University community. For those interested in communications, there are several campus publications as well as an FM radio station. Experience in music and drama is available in a number of forms. Totally, there are more than 380 special interest groups at the University.

Such activities can be a profitable means of fostering maturity and general enrichment in those students who wish to take advantage of all that the University can offer. In encouraging participation in these activities, the University asks only that students plan their time well, in order that they may profit as much as possible from a total University program devoted, first and foremost, to academic studies. Formal recognition for outstanding extracurricular achievement is given at an annual Student Leaders' Night held in the Spring.

STUDENT GOVERNMENT

All undergraduate students of the University are members of the Student Government Association (SGA). SGA is divided into three parts: Student Senate, Class Administration, General Court of Justice (Judiciary).

The Student Senate has vested in it all legislative functions of student government to the end of promoting the welfare of the student body. Any member of the undergraduate student body in good standing is eligible to



run for election to a Student Senate seat based on certain election requirements. Stockbridge students are represented on the Stockbridge Student Senate.

The Senate usually meets once a week, with considerable committee work throughout the week. (Non-senators may be appointed to Senate committees by the Senate President.) Meetings are open to any member of the University community.

In addition to Student Senate, there are provisions in the constitution and bylaws of each residence unit for elected house governments.

Students (both senators and non-senators) are also represented on a number of Faculty Senate and University committees and subcommittees. Appointments are made by the President of the Student Senate.

All students are encouraged to actively exercise the opportunity to participate in the deliberations of the Student Senate and student government, and to express their views on issues of concern to their Senate representative or through the appropriate Senate committee. All students should share in the responsibility of supporting and upholding their student government.

FACULTY SENATE COMMITTEE ON STUDENT AFFAIRS

The Bylaws of University Faculty Senate provide for a Committee on Student Affairs as follows:

- (a) Its composition shall be eight members of the Faculty, nine undergraduates, and the Dean of Students ex officio.
- (b) It shall review and make recommendations on all non-academic discipline, student rights, dormitory life, and all other matters of common concern to the faculty and students which are not within the scope of responsibility of some other regular or special committee of the Senate. It shall advise the Dean of Students and recommend policies for the operation of Student Personnel Services. It shall promote and protect the academic freedoms and civil liberties of students and shall hear complaints alleging the suppression, abridgement, or abuse of such freedoms and liberties. The Committee may also consider the policy aspects of extracurricular activities, but this authority shall not be construed as granting the Committee supervisory powers over the Student Senate or over other recognized student organizations.

SELECTED STUDENT ORGANIZATIONS

There are more than 400 recognized student organizations at the University of Massachusetts, Amherst. Among these are:

Campus Publications

The Collegian. Daily newspaper published by undergraduates.

Index. The University yearbook.

Caesura. Art and literary publication.

Spectrum. Publication of essays, short stories, and poems.

Yahoo. Humor magazine.

Engineering Journal. Quarterly open to science and engineering students for the publication of technical articles and essays of general interest.

University Music Organizations

Campus music organizations provide experience in musical and allied activities for performers and technicians with various kinds of interest and ability. The University Symphony Orchestra, bands, and the choral organizations are in the Department of Music. Membership is open to all students, faculty, alumni, and others in the area community.

University Symphony Orchestra. Membership is open, by audition, to all University students. The orchestra has developed rapidly into a large ensemble capable of performing the standard symphonic literature and contemporary works as well. Students who exhibit exceptional performing ability are given an opportunity, through competition, to appear as soloists with the orchestra in performance of major solo literature. Occasionally, distinguished guest artists are invited to appear. Membership in the University Symphony can constitute academic enrollment in a University course, and thus carry with it University credit toward requirements.

University Symphony Band. The University Symphony Band is open by audition to all University students. The band's extensive repertoire includes contemporary works for band and for wind ensemble, as well as the standard symphonic band literature. Enrollment in the Symphony Band allows a student to earn credit toward University graduation requirements.

University Marching Band. The University Marching Band is open by audition to all University students. Enrollment in the band allows a student to earn credit toward University graduation requirements. In addition, students accepted for membership earn exemption from required physical education during the football season.

University Varsity Band. The University Varsity Band is open to all University students. It is designed to offer instrumental participation to students whose schedule or lack of experience prohibits membership in the more advanced group.

University Chorus. The University Chorus, with a membership of more than one hundred voices, rehearses and performs oratorios and other large choral works in cooperation with various instrumental groups from the Music Department.

University Chorale. The University Chorale specializes in the preparation of the finest à cappella choral literature to be performed in concert on campus and on tour. In addition to the large performing chorus, students may take part in a madrigal group or other small vocal ensembles.

Operetta Guild. The Guild produces standard works from the repertoire of American musical theater. Membership is open to persons interested in an art form which provides experience in many elements of musical performance as well as in staging, acting, and other theater activities. The Operetta Guild is an R.S.O. organization.

Concert Association. The association offers students an opportunity to stage professional concerts and recitals and to administer a large-scale annual enterprise involving major financial and promotional concern. The association each year presents distinguished attractions including national symphony orchestras, outstanding operatic performers, instrumental virtuosi, and other offerings. The Concert Association is an R.S.O. organization.

The University of Massachusetts Theatre

The University of Massachusetts Theatre, an activity of the Department of Speech, schedules several plays a year, a program designed to give every student the opportunity of seeing living examples of the dramatic heritage of Western civilization in all forms and styles. The productions serve as the laboratory for all students majoring in theatre; however, all phases of work on these productions are open to all students regardless of school or major.

University Debate Union

The University Debate Union is an academic and co-curricular activity of the Department of Speech. Each year debate teams research and debate an inter-collegiate proposition dealing with an important international or national

problem. The debaters attend tournaments at colleges and universities throughout the United States. In addition to intercollegiate debating, the Debate Union also sponsors audience debates and tournaments for high school and college students. The union is open to all students on campus.

Professional and Special Interest Clubs

Approximately fifty professional clubs, established in connection with the various major courses of study, stimulate students' professional interest in their chosen fields and afford opportunity for discussion of technical subjects of mutual interest. Among the special-interest groups are the Debating, Sport, Parachute, Equestrian, Ski, Outing, and Political Clubs.

Student Honor and Service Societies

Adelphia. The men's senior honor society brings together the men in the University who are leaders in various branches of student activity. The society strives to preserve valuable traditions and customs and to advance the University in all ways. Membership is limited to a total of 20 men from the senior and junior classes.

Mortar Board. This national honor society for senior women has been represented on this campus by the Isogon Chapter since 1955. Selection of not less than five or more than 25 women is made on the basis of scholarship (B cumulative average), leadership, and service to Alma Mater. The purpose of the society is to promote University loyalty, to advance the spirit of service and fellowship among University women, to maintain a high standard of scholarship, to recognize and encourage leadership, and to stimulate and develop a fine type of college woman.

Maroon Key. The men's sophomore honorary-service society, composed of students recognized for leadership abilities and University services.

Scrolls. Women's sophomore honorary-service society, elected at the end of the freshman year.

Revelers. A group of upperclassmen chosen to promote and encourage freshman interest and participation in campus activities and other service-oriented projects.

Alpha Phi Omega, national service fraternity. The Kappa Omicron Chapter conducts an active program of service to the campus and the community. It is dedicated to the principles of leadership, fellowship, and service. The chapter conducts or supports various projects (Used Book Exchange, Homecoming Concert, Annual Foreign Students Convocation, United Nations Week, Peace Corps) in the interests of making contributions to brotherhood throughout the world.

Gamma Sigma Sigma. A national service sorority based on the ideals of service, friendship, and equality—open to all University women.

University Guide Service—ARCON

The University Guide Service, ARCON, inaugurated in 1965, disseminates information about the University and conducts tours for visitors and official guests.



In the conviction that ARCON must uphold the highest standards of responsibility and leadership, the fraternity men of the junior class who compose this organization are interviewed and screened in the spring preceding their year of voluntary service by a group of faculty, administrators and students. After their selection, the guides undergo intensive training.

Fraternities and Sororities

Social fraternities on the campus include Alpha Epsilon Pi, Alpha Tau Gamma (Stockbridge School), Beta Kappa Phi, Alpha Sigma Phi, Delta Chi, Pi Lambda Phi, Kappa Sigma, Lambda Chi Alpha, Phi Mu Delta, Gamma Alpha Kappa (Colony), Theta Sigma Phi (Colony), Phi Sigma Kappa, Q.T.V., Sigma Alpha Mu, Sigma Phi Epsilon, Tau Epsilon Phi, Tau Kappa Epsilon, Theta Chi, Zeta Nu. An Inter-Fraternity Council, consisting of representatives of these fraternities, has charge of rushing and all general matters dealing with fraternity life. A cooperative organization—The Fraternity Managers' Association—pools the financial resources of all sixteen fraternities for purposes of effecting orderly, economical purchasing and accounting procedures. A professional fraternity manager administers the association's program.

Sororities include Alpha Chi Omega, Chi Omega, Iota Gamma Upsilon, Kappa Alpha Theta, Kappa Kappa Gamma, Lambda Delta Phi, Pi Beta Phi, Sigma Delta Tau, Sigma Kappa, Sigma Sigma Sigma, and Sigma Sigma Alpha (Stockbridge School). The Panhellenic Council, made up of representatives from the sororities, supervises rushing and other sorority matters.

INTERCOLLEGIATE AND INTRAMURAL ATHLETICS

The University values the educational advantages of a well-organized intercollegiate and intramural sports program. In intercollegiate athletics, the University is represented by teams in all the leading sports, including football, soccer, cross country, basketball, swimming, wrestling, indoor and outdoor track, hockey, rifle, golf, tennis, baseball, lacrosse, gymnastics, and skiing.

The University also supports a broad program of intramural activities, in which all students are encouraged to participate. The range of sports available each year includes the team sports of touch football, basketball, bowling, volleyball, soccer, badminton, softball, horseshoes, handball, and tug-of-war. Individual activities include cross country, squash, wrestling, swimming, and tennis.

The University Intercollegiate Athletic Program is supervised by the University Athletic Council, which is composed of the following members: four faculty members, one member of the professional staff from the administration, three alumni members chosen by the Associate Alumni, the Executive Director of the Alumni Association, and, ex officio, the Director of Athletics and the President of the Student Senate.

The University is a member of the Yankee Conference, the National Collegiate Athletic Association, the Eastern College Athletic Conference and the New England College Athletic Conference.

ALUMNI ASSOCIATION

The Associate Alumni is the general alumni organization of the University. The association maintains headquarters at Memorial Hall, erected by alumni and friends in honor of those men of the University who died in World War I. A quarterly magazine, *The Massachusetts Alumnus*, is the alumni publication of the University. According to its bylaws, the corporation is constituted for the purpose of promoting the general usefulness of the University; of cultivating mutual regard among its graduates and former students; and of strengthening their attachment to their Alma Mater. Under sponsorship of the University of Massachusetts Building Authority, composed of alumni who volunteered their services, nineteen residence halls, two faculty apartment centers, and a Student Union Building have been constructed on the campus. The governing body of the Associate Alumni consists of its officers and a board of directors. Six directors are elected each year and serve a term of four years. All graduating seniors become members of, and contributors to, the association at graduation, according to a tradition set by the Class of 1940.

RELIGIOUS ACTIVITIES

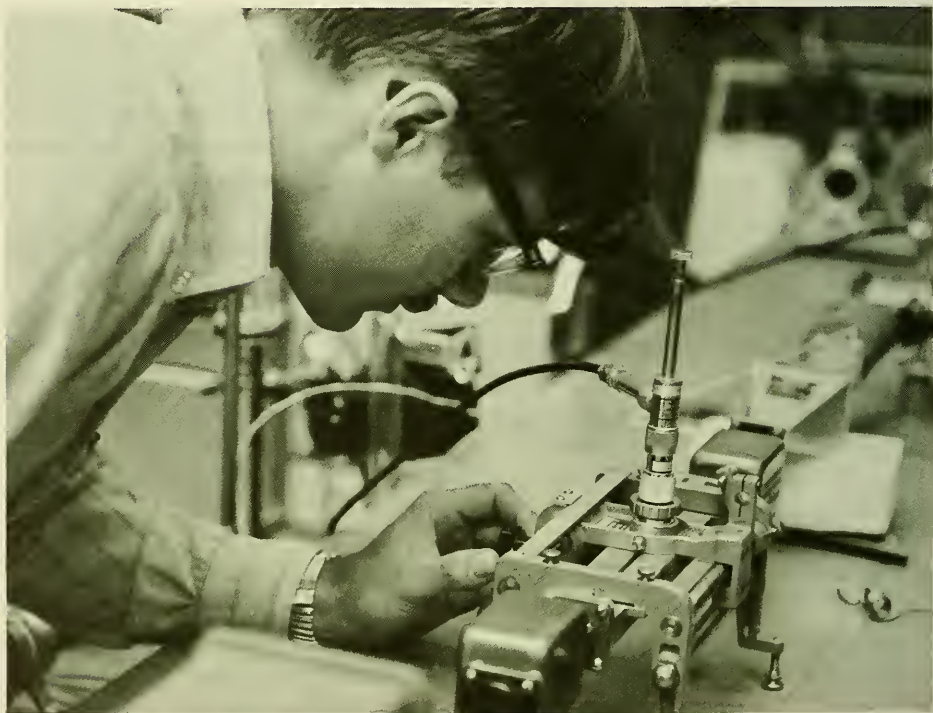
The University gives support to the religious life of its students in various ways. It affords the use of University facilities for student groups of all faiths. It cooperates with the official agencies of the three faiths most largely represented at the University by recognizing the contributions of their privately

supported chaplains and by giving them facilities and privileges for their work.

On campus, the religious life of Catholic students is enriched by activities and daily and Sunday Services at the Newman Center. Jewish students participate in services and activities sponsored by the B'nai B'rith Hillel Foundation. Protestant students are served by the United Christian Foundation, an ecumenical ministry providing counseling services as well as opportunity for involvement in service and social action.

Other religious groups such as the Baha'i Club, the Christian Science Organization, the Inter-Varsity Christian Fellowship, the Lutheran Club, and the Orthodox Club also meet regularly on campus and students interested in their programs are welcome to attend. The Campus Religious Council provides a cooperative inter-relationship among the campus religious groups and serves the whole University community by sponsoring the Annual Blood Drive, book and clothing drives, the Religious Handbook for Freshmen, and ecumenical discussion and action.

The local Protestant and Catholic churches of Amherst provide opportunities for Sunday worship, and Sabbath services for Jewish students are held on Friday evenings. Students are encouraged to attend the services of their respective faiths. Several denominations sponsor active student programs centered in the local churches as well, and students are welcome to attend events and join groups sponsored by the denominations.



Placement and Financial Aid

PLACEMENT

The Placement Office assists the individual to choose a career, prepare for it, enter upon it, and progress in it. Successful placement involves the following functions: counseling students and alumni in the selection of career objectives, assisting registrants in the planning of job campaigns, referring registrants to part-time summer and full-time jobs in all areas, serving as a reference and credential source, serving as a point of contact for employers' inquiries, providing facilities to accomplish these objectives.

Since placement is concerned with students all through their college experience it is suggested that use be made of these services beginning in the freshman year. Exploration of career possibilities should begin early, based on one's aptitudes and interest, training and personal requirements.

A career library containing information of a general nature, for browsing during the process of career planning as well as vocational guidance material covering opportunities with specific employers and information concerning graduate schools and numerous aids on the mechanics of job hunting itself, is available. Counseling is provided both on an individual and group basis in order to assist the individual in his career planning.

During the senior year registration with the Placement Office provides for further placement counseling, job referrals, and is a help to employers in selecting graduates. A campus interview program with potential employers is conducted each year. The services of the career counseling and placement staff are also available to all students in the graduate school as well as to alumni seeking change of position or finding employment following military service.

TEACHER CERTIFICATION: Employment in public schools requires teachers' certification. Students enrolled in an approved program through the School of Education meet the specified requirements for the Commonwealth of Massachusetts. Others, not so enrolled, should review their programs with the Educational Placement Officer prior to their senior year to make sure that requirements will be met upon graduation. Questions concerning certification locally and in states other than Massachusetts, specialized certification, documents that must be supplied, supply and demand, existing and projected vacancies, and the like may also be directed to the Educational Placement Officer.

FINANCIAL AID

University Loans

Through the generosity of friends of the University, funds have been donated to provide loans for a limited number of students of the three upper classes to

assist in paying tuition or other college expenses. These loans are granted, after proper consideration, to needy students of good scholarship. All loans are secured by a note endorsed by a responsible party as collateral. In general, if loans are taken out by a senior, they must be paid before graduation; otherwise they are due before the beginning of the next school year. Upon withdrawal from the University, loans automatically become due. On most of the funds, interest is charged at the rate of 3% to maturity and 5% thereafter. Application for loans should be made to the Placement and Financial Aid Services. No loan under this plan will be granted in excess of \$200 in any one year. If funds are available at the beginning of the second semester, loans may be made in exceptional cases to members of the freshman class whose scholastic record is satisfactory and whose budget calculations have been upset through circumstances beyond their control.

Higher Education Loan Plan

Loans up to \$1,000 per year may also be obtained by students from the bank of their choice through the Higher Education Loan Plan. Certification of attendance and other information relative to the students' overall record will be submitted to the bank prior to receipt of the loan. Further information can be obtained through the Placement and Financial Aid Services.

National Defense Student Loan Program

Students may borrow up to \$1,000 per year under this program. Interest at 3% starts nine months after completion of the program, repayment to be within ten years. Because of the amount of money available, this is necessarily a limited, selective program. Further information and application forms may be secured from the Placement and Financial Aid Services.

VETERANS AND VETERANS' DEPENDENTS BENEFITS

Veterans or dependents of veterans, eligible for educational benefits under the Veterans' Bill, P.L. 358, the Disabled Veterans Bill 894, or the War Orphan Bill 634, should present a Certificate of Eligibility at registration. A staff member coordinates all veteran affairs and is ready to help with appropriate clearance through the Veterans Administration. Veterans or veterans' children who are transferring to the University from another institution or who have done summer work at another institution will be required to submit a supplemental Certificate of Eligibility at registration. This may be obtained by applying through the veterans' office at the institution last attended.

SPECIAL FINANCIAL AID FOR GRADUATES INTERESTED IN FARMING

The Lotta M. Crabtree Agricultural Funds make available to graduates of the University, funds to be used for farm financing. The purpose of loans from these funds is to assist meritorious graduates who are without means in establishing themselves in agricultural pursuits. These loans are made without interest or service charges other than the cost of title search and legal papers.

They must, however, be paid back in full amount within a reasonable length of time and there are certain restrictions on their use. Applications for the "Lotta Crabtree Agricultural Fund" should be addressed to the Trustees of the Lotta M. Crabtree Estate, 619 Washington Street, Boston. Decisions regarding the granting of a loan rest entirely with the Trustees under the terms of Miss Crabtree's will.

EMPLOYMENT

College Work Study Program: Under this program students who meet established financial aid criteria can be assigned to part-time jobs on campus or to jobs with non-profit agencies in their community during the summer months. Like all other financial aid programs the deadline for applying is March 1.

Students who fill out part-time employment applications will be referred to jobs on campus as they become available.

The Placement and Financial Aid Service office also maintains a file of all off-campus employment opportunities that are brought to the attention of the office.

APPLICATION PROCEDURE—Scholarships, Loans, and Work

The University participates in the College Scholarship Service (CSS) of the College Entrance Examination Board. Participants in CSS subscribe to the principle that the amount of financial aid granted a student should be based upon financial need. **Whether or not aid has been received previously a new application must be filed each year. Aid in any one year does not guarantee the same amount of aid in subsequent years.**

Entering students seeking financial assistance are required to submit a copy of the Parents' Confidential Statement (PCS) to the College Scholarship Service, designating the University as one of the recipients. The form should be filed no later than March 1 of the admissions year. The PCS form may be obtained from a secondary school or the College Scholarship Service, P.O. Box 176, Princeton, New Jersey 08540, or P.O. Box 1025, Berkeley, California 94704.

Upperclass students should obtain the proper application from the Placement and Financial Aid Office, Room 239, Whitmore. These applications must be filed by March 1.

SCHOLARSHIPS

Scholarships consist of two types of awards. One is a straight monetary award. The other is a work scholarship called an Undergraduate Assistantship wherein a recipient of the award is required to perform work of an academic or educational nature (about 8 hours per week) under faculty or staff supervision. Scholarships in the form of monetary awards are given to members of all undergraduate classes whereas Undergraduate Assistantships are given only to members of the sophomore, junior, and senior classes. Scholarships and Undergraduate Assistantships are awarded only to needy and deserving stu-



dents whose scholastic records are satisfactory. The scholastic requirement for both types of aid is a 2.5 cumulative quality point average or a 2.0 to 2.5 with an average of at least a 3.0 in the fall semester. These awards are paid in installments at the beginning of each semester in the form of a credit on the student's bill. If the scholarship student withdraws from the University, any refund of University fees or charges must first be applied to reimburse the scholarship fund for the full amount of the scholarship received by the student for the semester.

General Scholarships

Albert Pierpont Madeira Scholarship Fund. Established in 1964 to honor the memory of Albert Pierpont Madeira (1911–1964), Assistant Professor of English, a distinguished teacher and devoted friend of generations of students. The fund was established from an initial grant by the General Electric Company in the amount of \$9,000, the sum won by a team of University scholars who successfully competed in the General Electric College Bowl over national television. Retiring as undefeated national champions, one of only thirteen collegiate teams to do so out of more than two hundred competing to that date, the four scholars—Susan Tracy '65, Michael Berrini '65, William Landis '65, and David Mathieson '64—were coached for many months by Professor Madeira. Because Professor Madeira had expressed great faith in the team's ability to compete with opponents from institutions throughout the country,

the team decided to appear on the program despite Professor Madeira's sudden death shortly before the date set for the first contest. After five successful appearances, the team was presented with the General Electric scholarship grant and an additional \$1,500 from Gimbel's Department Store, New York. The total grant of \$10,500, plus any other funds to be added thereto, is held as an endowed fund, the annual interest therefrom to be awarded in the form of scholarships to sophomores, juniors, and seniors at the University who have been recommended by the faculty on the basis of good scholastic performance and demonstrated services to the University and to their fellow students. Final selection of individual recipients is made by the Upperclass Sub-Committee of the University Committee on Financial Aid and Scholarships.

Alpha Sigma Phi Scholarship for needy students.

Danforth Keyes Bangs Scholarship for the aid of industrious and deserving students.

Lucius Clapp Fund to provide scholarships and loans to deserving students.

Foreign Student Scholarships. A limited number of scholarships, involving waiver of tuition fees only, awarded on basis of merit and need. Applications should be addressed to the Adviser to Foreign Students.

Henry Gassett Scholarship for a worthy undergraduate student.

Charles A. Gleason Scholarships. General Scholarship for worthy students.

Whiting Street Scholarships. Scholarships of \$50 each for deserving students.

University Associate Alumni Scholarships. A limited number of scholarships awarded on the basis of leadership, need, scholarship and participation in extracurricular activities.

University Foundation Scholarships. A limited number awarded to needy scholars.

Restricted Scholarships

George H. Barber Scholarship and Grant-in-Aid Awards. A limited number of scholarships or grants-in-aid based on evidence of outstanding athletic performance and good citizenship, need or high scholarship.

Class of 1882 Scholarship for the aid of a worthy student of the junior or senior class.

Frederick G. Crane Scholarships for the aid of worthy undergraduate students, preference given to residents of Berkshire County.

Stephen Davis Scholarship. Established by gift of Mr. and Mrs. Benjamin Davis, New York, in memory of their son, Stephen Davis, Class of 1954, who lost his life while serving as an officer with the United States Air Force. For a male undergraduate majoring in Liberal Arts or Social Sciences who has participated in the athletic program. The selection of the recipient is made jointly by the Dean of the College of Arts and Sciences and by the Dean of the School of Physical Education. The student selected receives each year, not to exceed four years, the full income from the fund so long as he remains in good standing in the University and continues to major in Liberal Arts or the Social Sciences. Annual income is approximately \$800.

Philip B. Hasbrouck Scholarship Fund. Established as an endowment fund through the generosity of the Class of 1910. Income from the fund is used for scholarships for certain deserving juniors and seniors studying a science essential to the national welfare, particularly physics. Students may obtain further information about the scholarship by inquiring at the Office of Placement and Financial Aid Services.

Interfraternity Council Scholarship. A \$100 scholarship awarded annually to a member of one of the social fraternities. The recipient must show evidence of need. In addition, he must have a record of participation in extracurricular activities and have at least a 2.5 quality point average.

Betsey C. Pinkerton Scholarships. Two general scholarships for graduates of the schools in the city of Worcester.

Sigma Xi Scholarship Award. The Massachusetts Chapter of the Society of the Sigma Xi makes an award of \$100 annually to an undergraduate student at the University in recognition of a developing research interest in the sciences or engineering.

Wilbur H. H. Ward Scholarships. Twenty-five scholarships of approximately \$100, known as the Wilbur H. H. Ward Scholarships. The Ward Fund is administered by a Board of Trustees independent of the University. Applicants for these scholarships write to Mrs. Marian R. Erush, Stockbridge Hall, University of Massachusetts, Amherst 01002. They are available to Hampshire County men.

College of Agriculture

Alvord. For students specializing in the study of Dairy Husbandry or Dairy Manufacturing with the intention of becoming an investigator, teacher, or special practitioner in the dairy industry. Restricted to students who do not use tobacco or fermented beverages.

O. G. Anderson Memorial Fund. For needy and worthy students majoring in pomology. To be used for the purchase of books and supplies. Granted only on the recommendation of the Department of Plant and Soil Sciences.

Ascension Farm. For men students in the College of Agriculture. Residents of Berkshire County have preference, but awards may be made to students from Hampshire, Hampden, and Franklin Counties.

Boston Flower Exchange Scholarship. A \$300 award to a student with a demonstrated interest in Floriculture. Scholarship given in memory of Rachel Dietz.

Buttrick. For junior, senior, or graduate students majoring in Dairy Industry or Food Science and Technology. Scholarships will range from \$100 to \$500 per year depending upon scholarship achievement and need.

H. B. Cantor Foundation. A \$500 scholarship for a student who plans to make hotel management his career, awarded on the basis of financial need and merit.

Club Manager's Association of America. \$300 for a major in Hotel and Restaurant Administration with a demonstrated interest in Club Management.



George M. Coddington. \$1,200 scholarships for majors in the College of Agriculture who graduated from a public high school in either Taunton or Martha's Vineyard.

Charles M. Cox Trust Fund Scholarship of \$300 is awarded to a student or students in the College of Agriculture on the basis of need, character, and scholarship ability. Preferably the scholarships will be awarded to undergraduate majors in dairy husbandry or poultry husbandry.

Dairymen's League Co-operative Association Scholarships. \$500 for a junior or senior in Agricultural and Food Economics with a demonstrated interest in Dairy Marketing or a senior planning on becoming a teacher of Vocational Agriculture.

Lawrence S. Dickinson Scholarship. \$250. Given by the Golf Course Superintendents' Association of New England. To be awarded to an undergraduate who has shown an interest in turf management and expects to continue in this field as a career. Those who are interested should contact the Chairman of the Scholarship Committee, Mr. Philip Cassidy, or Prof. Joseph Troll, Department of Plant and Soil Sciences. This scholarship will be awarded by the superintendents at one of their functions.

Fenway Motor Hotels Scholarship Fund. Preference to children of employees of Fenway Motor Hotels and other persons majoring in Hotel and Restaurant Administration.

J. W. D. French Fund. For students in dairy and forestry, and allied subjects.

Ernest G. Giovino. \$250 scholarship for a student majoring in Hotel and Restaurant Administration.

Golf Course Superintendents Association of America. \$300 for a student majoring in Plant and Soil Sciences with a demonstrated interest in Turf Management.

Henry Folsom Hoo Hoo. Scholarships for students majoring in Wood Technology.

Charles H. Hood Foundation. Awarded to two students in the College of Agriculture, with preference given to those studying the production of milk. Based on scholastic standing, character, industry, and personality.

Howard Johnson's. Two \$500 scholarships for Stockbridge students and one \$500 scholarship for a University student majoring in Restaurant and Hotel Management. Preference is given to children of Howard Johnson's employees and to those who have worked for the company.

Merwin Memorial Free Clinic for Animals. \$500 scholarships for students majoring in Pre-Veterinary or Animal Science.

Margaret Motley. For a woman student majoring in Floriculture or Landscape Gardening. Need, scholarship, and promise of success form the basis of the award which is provided by the Garden Club Federation of Massachusetts, Inc.

National Food Brokers' Association. \$400 to be awarded to either an undergraduate or graduate student in the Department of Agricultural and Food Economics who is interested in making a career in the food industry.

New England Hotel-Motel and Restaurant Educational Foundation. \$500 scholarships for students majoring in Hotel and Restaurant Administration.

New England Vegetable Growers Association. \$100 scholarship for a sophomore in agriculture. Applications should be made to the Secretary of the Boston Market Gardeners' Association, 240 Beaver Street, Waltham, Massachusetts 02154.

Porter L. Newton. For students majoring in Agriculture who are residents of Middlesex County.

New York Farmers. \$200 scholarships to the top senior, junior, and sophomore in the College of Agriculture, and \$100 to the top freshman—based on grades at mid-year.

Frank H. Plumb. For students majoring in the College of Agriculture.

Charles M. Powell. For students majoring in Forestry or Wildlife Biology.

Ralston Purina. \$500 scholarship for a student majoring in Veterinary and Animal Science.

V. A. Rice Scholarship Fund. A \$100 scholarship for a worthy student majoring in Animal Science.

Joseph C. Rich. \$100 scholarship for a student majoring in Fisheries Biology.

Saga Food Service. Five \$200 scholarships for students majoring in Hotel and Restaurant Administration, awarded on the basis of need and merit.

Ellsworth Milton Statler Foundation. \$500 scholarships for students majoring in Hotel and Food Management. Students must be recommended by the University Scholarship Committee and approved by a Committee of the Statler Foundation.

Springfield Garden Club. For students living in the vicinity of Springfield, Massachusetts, and majoring in some phase of Horticulture.

Stouffer Foundation. Three \$200 scholarships for students majoring in Hotel and Restaurant Administration, awarded on the basis of need and merit.

Stouffer Foods Corporation Fund. Two \$250 scholarships to students majoring in Hotel and Restaurant Administration.

George Treadwell. \$100 scholarship given by Worcester County Poultry Association to a needy and worthy student from Massachusetts who is majoring in Poultry Husbandry at the Stockbridge School of Agriculture.

Frank M. West. \$100 scholarships for Forestry majors.

School of Engineering

Alumni Scholarships. Provided by annual contributions from graduates and friends of the School of Engineering to provide scholarships to deserving and well qualified students pursuing work in a major field of engineering. They are available to freshmen and upperclassmen.

Kollmorgen Optical Corporation Tuition Scholarship. Awarded annually to a junior or senior student majoring in mechanical engineering. Awarded on the basis of need and superior scholastic attainment.

Western Massachusetts Section, American Society of Mechanical Engineers. Awarded annually to a junior or senior mechanical engineering student who is a legal resident of the area represented by the section. Awarded on the basis of need and scholastic attainment.

Army ROTC Scholarship Program

One- to four-year Army ROTC Scholarships are competitively awarded, based on the applicants' abilities, accomplishments and demonstrated leadership potential. The scholarships pay for tuition, textbooks, laboratory fees and other purely educational expenses. In addition the student receives a subsistence allowance of \$50 per month for the duration of the scholarship. Further information can be obtained from the Department of Military Science.

Air Force ROTC

Substantial scholarships, granting \$50 per month and, in addition, defraying all University tuition, laboratory fees and textbook expenses, are awarded to selected cadets. These scholarships are available only to juniors and seniors enrolled in the four-year Air Force ROTC program.

The Armed Forces Communications and Electronics Association will award one \$500 scholarship annually to a sophomore AFROTC cadet for undergraduate university study in Electrical, Electronics, or Communications Engineering, and/or Technical Photography.

College of Arts and Sciences

Richard W. Fessenden Memorial Scholarship. An award made to undergraduate students majoring in chemistry upon the recommendation of the department of chemistry. This award is made possible by donations from friends and former students of Dr. Fessenden, former professor of chemistry at the University.

Massachusetts City Managers' Association Scholarship. Tuition scholarship awarded by committee composed of the President of the City Managers' Association, the head of the department of government and the Director of the Bureau of Government Research, to an undergraduate or graduate student majoring in government.

Public Health

Massachusetts Department of Public Health Scholarship. A scholarship in the amount of \$300 made to an outstanding student in the field of bacteriology and public health.

Massachusetts Association of Sanitarians Scholarship. A scholarship in the amount of \$100 made to an outstanding student interested in the general field of public health.

Massachusetts Milk Inspectors' Association. One or more scholarships, each in the amount of \$100, made to outstanding students interested in the field of sanitation or milk sanitation.

Public Health Service Traineeship for graduates and undergraduates, one or more annually, complete expenses paid as a stipend.

William B. Palmer Scholarship for juniors and seniors majoring in Sanitary Science or Public Health, \$300 annually (The International Association of Milk and Food Sanitarians).

School of Home Economics

Berkshire County Women's Advisory Council Scholarship. For a student majoring in Home Economics who is a resident of Berkshire County. Preference may be given to applicants who have indicated an interest in Extension work as a career.

Minnie R. Dwight Scholarship. For a student majoring in Home Economics who is a resident of Hampden County. This scholarship is awarded for four years if scholarship is maintained.

Mrs. Clifton Johnson Scholarship. For one or more Home Economics students who are residents of Hampshire County. Preference may be given to applicants who have indicated an interest in Extension work as a career.

Helen Knowlton Award and Scholarship. The award is for the highest ranking senior Home Economics student. Scholarships are for other deserving Home Economics students.

Massachusetts Home Demonstration Council Scholarship. For a Home Economics student at Framingham State Teachers College or the University of Massachusetts.

Sears, Roebuck Foundation Scholarships. For two incoming freshmen.

Recipients are selected by the School of Home Economics from applications filed with the University Committee on Financial Aid and Scholarship. The basis for this award is high scholastic record, qualities of leadership and interest in Home Economics as a career.

Stouffer Restaurant Corporation Scholarship. For a Home Economics student majoring in Nutrition and Food.

Mildred Thomas Scholarship. For a student majoring in Home Economics at Regis, Simmons, State College in Framingham, or the University of Massachusetts. The applicant must be a resident of Worcester County and have completed the freshman year.

Helen A. Whittier Award. For a senior Home Economics student selected on basis of scholarship, need, and character.

4-H Scholarships

Cotting Memorial Scholarship. All college expenses of freshman year—for a woman student. Recipient of this scholarship is selected by a committee of the New England Branch of the Farm and Garden Association from among candidates proposed by State Leaders of 4-H Club work in New England.

Esso Scholarship. This scholarship of \$800 is awarded to a freshman enrolled in the College of Agriculture. The recipient receives \$200 during each of the four years he is enrolled. Applications for this scholarship must be submitted to the State 4-H Club leader.

George L. Farley Scholarships. The Massachusetts Society for Promoting Agriculture has established a scholarship in memory of George L. Farley. The income of approximately \$60 per semester is awarded to deserving 4-H Club members, men or women, recommended by the State Leader of 4-H Clubs from applications submitted by County 4-H Club Agents.

Scholarships for Women Students Only

Chi Omega Award. The local chapter of the Chi Omega Sorority makes an award of \$100 to a woman student majoring in the department of economics or psychology who has the highest scholastic average at the end of the first semester of the senior year.

Greater Springfield Panhellenic Association Award. This award is given each spring for use in the sophomore, junior, or senior year to a woman student from western Massachusetts. The award is based on scholarship and need, character and evidence of leadership in campus activities.

Scholarships Abroad

Many U.S. Government, private foundations, and foreign government scholarships are available to qualified seniors for graduate studies abroad. Interested students should get an early start in language competence and in maintaining academic excellence. Several campus committees screen students for Fulbright Scholarships, Danforth Fellowships, Woodrow Wilson Fellowships, etc.

Applicants are usually considered in October of the senior year. Specific deadlines are posted on campus bulletin boards. The Office of Placement and Financial Aid Services maintains a library of up-to-date information about such scholarships.



HONORS, PRIZES AND AWARDS

Scholastic Prizes

Phi Kappa Phi Awards for Scholarship. The University of Massachusetts chapter of Phi Kappa Phi, national all-university scholastic honor society, annually presents substantial monetary awards to the outstanding scholar or scholars of each of the four classes. These awards, based upon cumulative scholastic averages and character, are presented at the Honors Banquet in the spring.

Hills Botanical Prize. This is given through the generosity of Henry F. and Leonard M. Hills of Amherst for the first and second best herbaria. Competition is open to members of the senior, junior, and sophomore classes. First prize is \$20, second prize \$15.

Massachusetts Society for Promoting Agriculture Prizes. Three prizes of \$25, \$15, and \$10 are awarded to those senior students who are judged to have made the best record in a speaking contest held in March.

Sigma Xi Scholarship Awards. The Massachusetts Chapter of the Society of the Sigma Xi makes an award of \$100 annually to an undergraduate student at the University in recognition of a developing research interest in the sciences or engineering.

Betty Steinbugler Prize in English. This prize was endowed by John L. Steinbugler, New York City, in honor of his daughter, Elizabeth Steinbugler Robertson, a graduate of this University in 1929. It is awarded to a woman in the junior or senior class who has written the best long paper on a subject of literary investigation in a course in English during the year.

L. R. Wilson Award in Geology. This award, named in honor of the former head of the Geology Department, is conferred on the graduating senior with an outstanding academic record as a major in geology.

Philip B. Hasbrouck Science Award. This award was established by the class of 1910 to honor an outstanding teacher, once head of the Department of Physics. The award, made annually to a junior or senior majoring in Physics upon recommendation of the Department, is intended to encourage superior scholarship in the field.

Athletic Awards

Oswald Behrend Award. This award is made annually to the scholar-athlete in the senior class whose achievements of overcoming a physical handicap best exemplify the courage, desire, sportsmanship, and rich philosophy of Oswald Behrend, class of 1917. The award is made possible by the Lawrence P. White family, long-time friends of Mr. Behrend.

Chester F. Bowen Jr. Memorial Award. The class of 1949 presented the Chester F. Bowen Jr. Memorial Award in track and cross-country to the University as its class gift. Members of the class felt that this gift would be a fitting memorial to a former classmate and a worthy award for the outstanding athlete in varsity track and cross-country.

Samuel S. Crossman Memorial Trophy. This award is made to a member of the senior class who must have received two varsity awards, had an above-average academic record, possessed qualities of enthusiasm, cooperation, leadership, and be recognized as the outstanding student-athlete on the campus. The award established by the University Athletic Council, is dedicated to the memory of Samuel S. Crossman and consists of a trophy upon which the name of the student chosen is inscribed. A small replica is presented for his permanent possession.

L. L. Derby Award. This plaque is presented by the Alumni Varsity M Club each year at its Commencement meeting to that member of the track team considered to have been the most valuable member of the team during the past season.

Eastern College Athletic Conference Award. This award is designed to honor the student having a combined record of academic and athletic excellence at each Conference member college. The E.C.A.C. is composed of 114 colleges and universities located in the eastern section of the United States.

The William T. Evans Memorial Trophy. This trophy is given each year to that member of the varsity football team who through his sportsmanship, football ability, character, and personality, has exemplified the character and spirit of the person in whose memory this memorial trophy is dedicated. The trophy is dedicated to the memory of William T. Evans, a former member of the class of 1942, who died December 9, 1941. This trophy is presented annually by the class of 1942.

Golf Award. Presented to the most valuable member of the Golf Team as chosen by the letter men of the squad.

Gymnastics Cup. Awarded to the most valuable member of the Gymnastics Team.

Hockey Award. Awarded annually at the Commencement meeting of the Varsity Club to that member of the hockey team who is considered to have been the most valuable player on the team.

The Joseph Lojko Memorial Plaque. Presented to a senior three-sport letter man, having a satisfactory scholastic record and showing those qualities of enthusiasm and cooperation which make for leadership. It is awarded in honor of Joseph Lojko of the Class of 1934, outstanding athlete who died while a senior in the College.

Manager of the Year Award. The Athletic Association awards a gold plaque to that varsity sports manager who has demonstrated initiative and proficiency in managerial duties.

Pistol Medal. Awarded on a point basis to a member of the varsity team.

The Allan Leon Pond Memorial Medal. Awarded for general excellence in football in memory of Allan Leon Pond of the class of 1920, who died February 26, 1920. He was described as "A congenial companion, a devoted lover of Alma Mater, a veteran of World War I, a fine all-around athlete and a true amateur. He would rather win than lose, but would rather play fair than win." He has been characterized as a typical student of the University.

Rifle Award. Awarded on a point basis to the outstanding member of the varsity rifle team.

Paul Sears Putnam Memorial Tennis Trophy. Awarded to that member of the varsity tennis team who has displayed by his conscientious endeavor, clean play, good sportsmanship and all-around ability as an athlete and scholar, that he is a credit to his team and University. The recipient shall have his name inscribed on the trophy. He shall also be presented with a suitable medal or watch charm. The trophy is established in memory of Paul Sears Putnam, '38, by the members of his family, in the hope that it will stimulate and encourage students to emulate his characteristics of wholehearted enthusiasm and good sportsmanship, true cooperation and the constant endeavor to always give to the best of their ability in any project they may undertake.

George Henry Richards Memorial Cup. Awarded annually to the member of the basketball team who shows the greatest improvement in leadership, sportsmanship, and individual and team play during the year. It is in memory of George Henry Richards of the class of 1921 who died suddenly while a student at the College.

Samuel B. Samuels Basketball Cup. Presented annually in the name of Samuel B. Samuels of the class of 1925 who was an outstanding basketball player during the early years of basketball as a varsity sport at the University. The trophy is awarded to that letter man who is a regular member of the varsity team and who has performed with excellence during scheduled varsity games.

Maurice Suher Soccer Plaque. Awarded annually to that letter man of

the varsity team deemed to have been the most valuable member of the team. It is presented to the University by Maurice Suher of the class of 1930, who was one of the two students largely instrumental in having soccer recognized as a varsity sport at the University. He played on the first varsity soccer team at the University of Massachusetts, in the fall of 1929.

Sports Dad Award. The Sports Dad Association was formed in 1958 and consists of fathers of all varsity athletes. This association awards three trophies to outstanding athletes for scholastic achievement and athletic excellence.

Swimming Trophy. Awarded to the most valuable member of the varsity swimming team.

E. Joseph Thompson Memorial Trophy. This baseball trophy is given by Thomas Thompson in memory of his brother, E. Joseph Thompson who graduated from Massachusetts State College in 1932. He was president of the Student Senate, a varsity letter man in football and baseball, and an outstanding campus citizen. The award goes to that member of the varsity baseball team who best exemplifies the most admirable characteristics of the sport each year.

Wrestling Trophy. Awarded to the most valuable member of the varsity wrestling team.

Military Science Awards

Silver Star for Academic Excellence. Awarded to those ROTC cadets who maintained a University academic average of over 3.0 for the previous semester. The award is authorized for wear only until the next semester grades are published.

Gold Star for Academic Excellence. Awarded to those ROTC cadets who maintained a University academic average of between 2.5 and 3.0 for the previous semester. The award is authorized for wear only until the next semester grades are published.

Military Proficiency Ribbon. Awarded to those ROTC cadets superior in military knowledge each semester. To be eligible for this award a basic course cadet must be in the upper third of his military class and found superior in military bearing. Advanced Course Cadets must be in the upper half of the class and found superior in military bearing. The award is authorized for wear only until the next semester grades are published.

Department of the Army Awards. The Department of the Army awards annually the Superior Cadet Ribbon with certificates and lapel device to one outstanding student in each academic class. The winner of the award must be in the upper one fourth of his academic class and be selected by the PMS and Dean of Men.

Distinguished Military Students. Members of the second-year Advanced ROTC Course who, as designated by the Professor of Military Science, possess outstanding qualities of leadership, high moral character, and definite aptitude for military service. Students so designated must possess an academic standing in the upper half of their class or stand in the upper 10% of their



class in military subjects. All distinguished military students are authorized to wear the Distinguished Military Student Badge.

Distinguished Military Graduates. Members of the graduating class who were previously designated as Distinguished Military Students, who have maintained the same high standards required for such designation, and who have successfully completed training at the Reserve Officers' Training Camp.

Associate Alumni Award. Awarded by the University of Massachusetts Associate Alumni to the Senior ROTC cadet who, having demonstrated superior qualities of leadership, had been selected as a Distinguished Military Student, is in the upper 25% of his military class and in general exemplifies the attributes of a potential military leader. A 45-caliber pistol is presented to the winner by a representative of the Associate Alumni.

Reserve Officers Association Award. Awarded by the Reserve Officers Association of the United States, Massachusetts Department, to the Senior Army ROTC cadet who is outstanding in military proficiency. The winner's name is engraved on a plaque, and a medal, appropriately engraved, is given by the Massachusetts Department. An award is also presented to the individual by the Amherst Chapter.

Amherst Lions Club Award. Awarded by the Amherst Lions Club to the Military Science Cadet who contributed the most to the Army ROTC Brigade.

Association of the United States Army Medal and Certificate. Awarded annually by the publishers of the Army Magazine to the Junior Cadet who has demonstrated outstanding qualities of leadership and efficiency.

Elizabeth L. McNamara Trophy. Awarded in honor of Mrs. Elizabeth L. McNamara, a former trustee of the University of Massachusetts, to the Army ROTC cadet ranking first in scholarship in the second-year basic course. The winner's name is engraved on a plaque and a sterling silver goblet, appropriately engraved, is presented.

Military Science Award. Awarded to the first year-Basic Course cadet having demonstrated outstanding leadership potential and military proficiency. A sterling silver goblet, suitably engraved, is presented.

Air Science Awards

University of Massachusetts Associate Alumni Award. Presented to the outstanding Air Science graduate.

Air Force Association Award. Presented to the graduating senior who has displayed those characteristics of leadership that are indicative of future success as an Air Force officer.

American Legion Scholarship Awards. Presented to the Air Science senior and junior cadets who have demonstrated outstanding scholastic abilities and leadership potential.

Air Force Times Award. Presented to the graduating cadet who has distinguished himself by bringing constructive attention to the Air Force ROTC.

Armed Forces Communications and Electronics Association Award. Awarded to the Air Science 400 cadets majoring in Electrical Engineering, Electronics, or Communications Engineering who has demonstrated outstanding leadership potential.

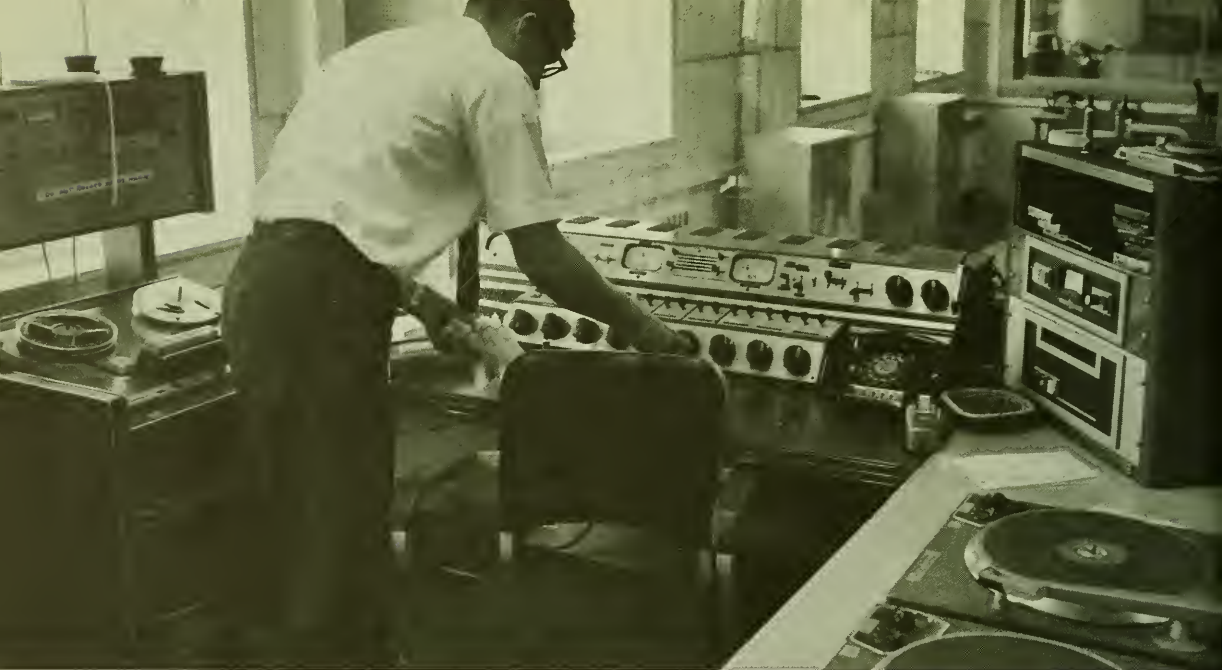
Society of American Military Engineers Award. Awarded to a student enrolled in the Professional Officer Course, who is selected by the Professor of Air Science and the Dean of the School of Engineering as having demonstrated outstanding abilities in the engineering and Air Science programs.

Reserve Officers Association Award. Presented to the Air Science 300 and Air Science 400 cadets who have excelled in both scholarship and leadership.

General Dynamics Award. Presented to the sophomore cadet who has demonstrated those characteristics of leadership and scholarship which predict future success in the Professional Officer Course.

Sons of the American Revolution Medal. Presented to a freshman cadet who has shown a high degree of initiative, leadership potential and scholastic achievement in Air Science studies and activities.

Daughters of the American Revolution Award. Awarded to a graduating senior who has demonstrated those qualities of dependability, leadership, and patriotism, and whose contributions have significantly improved the Air Force ROTC program at the University.



General Services

LIBRARIES

The University Library system consists of the central building, Goodell Library, and a number of departmental collections. Present holdings include about 700,000 books and periodical volumes and government documents, and 70,000 microforms. A central card catalog lists under author, title, and subject all books to be found in Goodell and the departmental libraries. Since 1965 the Library has purchased all University-level books currently published in the major Western languages. About 8,000 literary, scientific, scholarly, and popular periodical titles are received. Periodicals are housed in Goodell or the departmental libraries, according to their subject matter. Holdings and locations are listed in both the card catalog and the University's *Catalog of Journal and Serial Holdings*, a computer-produced book that is brought up to date annually.

Goodell Library contains the major portion of the collection, including the reference collection, special collections of rare books and manuscripts, University archives, and microforms. The Library is a depository for U.S. Government publications and receives regularly many publications of the United Nations, other international agencies, and the Commonwealth, cities, and towns of Massachusetts.

Two libraries, now under construction, are expected to be completed in 1971: the 28-story central library designed by Edward Durell Stone to house 2¼ million volumes and seat 3,000 readers, and the Physical Sciences Library designed to house 200,000 volumes and seat 300 readers.

Hampshire Inter-Library Center

Housed in Goodell Library is the Hampshire Inter-Library Center, a cooperative facility for the acquisition, storage, and servicing of research materials, especially journals, documents, and reference sets. HILC is jointly operated by Amherst, Mount Holyoke, and Smith Colleges, the University of Massachusetts, and the Forbes Library of Northampton. The collection numbers more than 30,000 bound volumes and many files of unbound issues and microforms; some 800 journals are received currently.

THE UNIVERSITY OF MASSACHUSETTS PRESS

A member of the American Association of University Presses, The University of Massachusetts Press is dedicated to publishing outstanding scholarly and artistic works. Manuscripts are approved for publication by a committee appointed by the Faculty Senate. Offices of the Press are in Munson Hall.

OFFICE OF UNIVERSITY RELATIONS

The Office of University Relations serves 1) as liaison between the campus community and the general public, and 2) as an internal information center for the benefit of faculty, students, and administration. Its primary function is to provide accurate information about the University's current and projected programs and thus to foster understanding of the institution's mission as a nationally recognized facility of higher education, research, and public service. To fulfill its program, the Office of University Relations assigns specific responsibilities to three departments: *Publications*, *News*, and *Photographic and Broadcasting Services*. Through these departments the office supplies information to all communications media as well as to agencies of government, schools and other educational institutions and foundations, professional societies, research organizations, extension agencies, and to individuals who request data of various kinds.

OFFICE OF BUDGETING AND INSTITUTIONAL STUDIES

The Office of Budgeting and Institutional Studies performs university-wide budgeting functions in the areas of data collection, preparation of budget request documents, and the making of continuing analyses of budget expenditures. In addition to budgeting functions, the office conducts research within the field of higher education and concerns itself with both the University and comparable institutions of higher learning. These research findings are used to assist the administration and faculty in the continuous analysis and improvement of University practices. The office also provides a resource library on higher education which is available to all members of the University community.

BUREAU OF GOVERNMENT RESEARCH

The Bureau of Government Research is staffed by professional personnel, experienced in state and local government research. Its work consists of research in governmental problems, in decision-making theory, and in community power analysis. The bureau also conducts training institutes for public officials, provides consultative services to cities and towns, and maintains a research library.

LABOR RELATIONS AND RESEARCH CENTER

The Labor Relations and Research Center facilitates instruction and research, and conducts extension programs in labor education. Assisted by an Advisory Council composed of faculty and labor representatives, the center seeks to identify major problems affecting labor in Massachusetts and supports research on these problems. The center's staff also plans and conducts short courses, conferences and seminars on and off campus in order to meet the needs of the labor movement and its membership.

Under an interdisciplinary faculty committee, programs of study are available that allow an undergraduate to concentrate, within his regular major department, in the field of labor relations. In cooperation with the Graduate School Council, the center also provides for a master's degree program in labor studies and sponsors graduate assistantships and fellowships for qualified students.

THE MASSACHUSETTS POPULATION RESEARCH INSTITUTE

The Massachusetts Population Research Institute has a twofold purpose: (1) to serve as a center for the analysis of the structure of and changes in contemporary Massachusetts population; and (2) to provide training for undergraduate and graduate students in the techniques of demographic analysis. The Institute publishes a series of working papers on the major aspects of Massachusetts demographic structure.

PROGRAM IN URBAN AND REGIONAL PROBLEMS

The problems associated with large numbers of people living together in small geographical areas involve many traditional academic disciplines. The departments listed below have developed cooperatively a curriculum for students who have an interest in applying the knowledge of their major to the problems of cities and their effects on adjacent suburban and rural areas. Interested students can obtain information from the following cooperating departments: Agricultural Economics, Civil Engineering, General Business and Finance, Government, Landscape Architecture, Sociology.

POLYMER RESEARCH INSTITUTE

The Polymer Research Institute carries on a program of advanced studies directed toward gaining greater understanding of the chemistry of plastics. Research is conducted to find better methods for studying the properties of

plastic films, fibers and rubbers, and for establishing a relationship between the structure and properties of these materials.

INSTITUTE OF AGRICULTURAL AND INDUSTRIAL MICROBIOLOGY

The Institute of Agricultural and Industrial Microbiology is presently engaged in research regarding the use of microorganisms in the production and processing of agricultural and industrial products such as food and fibers and the control of microorganisms harmful to man and his environment.

UNIVERSITY COMPUTING CENTER

Important to the many research projects undertaken on a continuing basis at the University and to the educational program in most of the departments of instruction is the University Computing Center. This Center houses the computing machines and peripheral equipment necessary for the broad range of services required by the faculty and students of the University. The Center also has an applications programming service to consult with users, to provide programming assistance and advice on use of the program libraries, and to offer short courses on programming and the use of the computing facilities.

COOPERATIVE SERVICE BUREAU

The Cooperative Service Bureau is an experimental project designed to field test a central data processing system to assist colleges in preparing admissions and financial aid information for use in selection, counseling and research. Twelve universities and colleges have agreed to participate in this program.

WATER RESOURCES RESEARCH CENTER

The establishment of this center at the University has resulted in an expansion of training and research in many diverse aspects of water resources. In addition to the degrees which may be obtained in geology and biology, degree programs are offered in several related fields which train water specialists.

COOPERATIVE SCHOOL SERVICE CENTER

Operated by school systems in New England and the School of Education at the University, the center has as its purpose the improvement of the quality of education, the initiation of in-service training and research facilities and the improvement of administration-school board effectiveness.

TECHNICAL RESOURCE SERVICE

Affiliated with the School of Engineering, this is the technological extension service which links the University with industry. It works to extend the application of modern technology in existing industry and commerce, and to generate activities leading to new technologically-based industries and employment. It draws on the full scientific, technological, and business resources, and the complete range of disciplines, available in the University system, and

cooperates with all other qualified sources in providing technical expertise to industry.

COOPERATIVE WILDLIFE RESEARCH UNIT

The Cooperative Wildlife Research Unit is supported by the U.S. Fish and Wildlife Service, the Wildlife Management Institute, the Massachusetts Division of Fish and Game, and the University of Massachusetts. The function is to conduct research and extension programs, and to facilitate undergraduate and graduate instruction in wildlife biology.

COOPERATIVE FISHERIES RESEARCH UNIT

The Cooperative Fisheries Research Unit is supported by the U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Sport Fisheries and Wildlife, and the University of Massachusetts. The function is to conduct research and extension programs, and to facilitate undergraduate and graduate instruction in fisheries biology.

ACADEMIC HONOR SOCIETIES

Phi Beta Kappa. Phi Beta Kappa, the oldest honor society in the United States, was founded at the College of William and Mary on December 5, 1776. The Society recognizes superior scholastic attainment and capacity for high achievement in the arts, humanities, and sciences. At the University of Massachusetts an informal association of Phi Beta Kappa was founded in 1931 by members of the faculty having official standing in the Society. In 1932 the University association, while not authorized to elect students to official membership, was permitted to designate an outstanding student as a Phi Beta Kappa Scholar who would be listed as such in the Commencement program. Selection of such a student has been made each year since 1932. In 1964, at the Triennial Meeting of the Society, the University of Massachusetts was authorized to open an official chapter, Nu of Massachusetts, and to elect students to membership in the Society. The chapter was installed in 1965. Students are elected to membership according to the general criteria of academic excellence in a liberal course of study and good moral character as prescribed by the national society. The degree recipients who are members of Phi Beta Kappa are listed in the Commencement program each year.

Phi Kappa Phi. The Honor Society of Phi Kappa Phi is a national organization, and has been represented on this campus since 1904. Its primary objective is the recognition and encouragement of superior scholarship in all fields of study. Good character is an essential supporting attribute. The Massachusetts chapter elects undergraduates in either their junior or senior years. Members of the Faculty and graduate students are also eligible for election.

Sigma Xi. The Society of the Sigma Xi is the national honor society whose objective is the encouragement of original investigation in science, pure and applied. Since 1938, a chapter of the Society has been active on the campus of the University. The Chapter may elect to associate membership under-

graduate students who have shown marked excellence in the study of recognized fields of the sciences and engineering. Election to full membership is accorded those who have clearly demonstrated ability to pursue independent scientific research. The Chapter sponsors a program of public lectures and a number of awards designed to foster the objectives of the Society.

Sigma Gamma Epsilon. The Beta Theta chapter of the Sigma Gamma Epsilon Fraternity was installed at the University of Massachusetts in 1951. The purpose of the fraternity is to stimulate scholastic, scientific, and social advancement of students of the earth sciences in universities and scientific schools with recognized standings in the United States and Canada. Membership is open to men majoring in geology, mining, metallurgy, ceramics, petroleum engineering, or other branches of earth sciences, who meet the requirements of the fraternity.

Omicron Nu. The Alpha Pi chapter of the Society of Omicron Nu was installed on the campus in 1952. The purpose of the Society is to recognize superior scholarship and to promote leadership and research in home economics. Membership is open to juniors and seniors majoring in home economics who meet the requirements of the society.

Phi Tau Sigma. Phi Tau Sigma honor society is the international honor society for food science. The society was founded at the University of Massachusetts in 1953. Its purpose is to encourage and recognize achievement in the general area of food science. Senior students from all departments related to food science are eligible for election to membership if they meet the society's scholastic and leadership requirements. Graduate students and faculty are also eligible for membership.

Phi Eta Sigma. The Society of Phi Eta Sigma was installed on the campus in 1955. The purpose of the Society is to recognize outstanding scholastic achievement by freshmen men and to encourage a higher standard of learning among all freshmen. Honorary membership is granted those faculty members who are most effective in encouraging students in the attainment of these goals.

Tau Beta Pi. The Massachusetts Zeta Chapter of Tau Beta Pi was installed on campus in 1955. The society exists for the purpose of honoring engineering students of high scholarship, character, and interest in campus activities. Senior and junior students in the School of Engineering are eligible for election to membership if they meet the requirements.

Beta Gamma Sigma. The Gamma Chapter of the University of Massachusetts was installed in 1959. The purposes of the Society are to encourage and reward scholarship and accomplishment among students in commerce and business administration; to promote the advancement of education in the art and science of business; and to foster integrity in the conduct of business operations.

Alpha Lambda Delta. The Honor Society for Freshman Women was installed at the University of Massachusetts as a chapter of Alpha Lambda Delta, national honor society, in 1960. The purpose is to promote intelligent living and to encourage superior scholastic attainment among freshman women.

Members are students who achieve averages of 3.5 or above in the first semester or in cumulative average at the end of the first year of college.

Eta Kappa Nu. Delta Eta Chapter of the Eta Kappa Nu Association was installed on this campus in 1960. The purpose of the association is to recognize outstanding scholarship and leadership in the field of Electrical Engineering. Superior junior and senior students are selected for membership in the fall and spring of each year.

Alpha Zeta is an honor society with membership limited to men majoring in the College of Agriculture. Election to membership is based upon academic excellence and qualities of leadership.

Xi Sigma Pi. The Psi Chapter of Xi Sigma Pi, national forestry honor society, was inaugurated at the University in 1962. The purpose of the society is to secure and maintain a high standard of scholarship in forestry education. Membership is open to juniors and seniors in the Department of Forestry and Wildlife Management who demonstrate leadership ability and who meet other requirements of the fraternity.

Alpha Pi Mu. The Massachusetts Chapter of Alpha Pi Mu, the national Industrial Engineering Honor Society, was installed in 1966. The purpose is to confer recognition upon those students of industrial engineering who have shown exceptional academic interests and abilities. Junior and senior students, faculty, and alumni are eligible for membership.

Kappa Delta Pi. The Kappa Lambda chapter of Kappa Delta Pi was established at the University in 1965. This society encourages high professional, intellectual, and personal standards in the field of education. The local chapter elects undergraduates in either their junior or senior years. Graduate students and members of the faculty are also eligible for membership.

Phi Sigma Alpha. The national political science honor society. Its purpose is to stimulate interest and promote excellence in government and politics. Superior junior and senior students majoring or minoring in government are selected for membership.

OVERSEAS STUDY

Freiburg Program. In cooperation with the University of Freiburg, Germany, the University of Massachusetts operates its year-long Freiburg Program. The University of Massachusetts has a permanent facility in Freiburg, the Atlantic Studies Institute, which serves as the headquarters of the Freiburg Program. Students enrolled in the Program are regularly enrolled students of the University of Freiburg, and take courses in a wide range of social science and humanities courses. The Freiburg Program is not restricted to students concentrating in German only, but admits students in philosophy, music, English, history, comparative literature and other fields.

Enrollment is limited to graduate students and superior upper division undergraduates with fluency in German. Students enrolled in other American colleges and universities may also apply. Candidates are expected to enroll in

a special preparatory course and seminar which is offered in the spring semester, unless excused on the basis of language proficiency.

Cost for the two semesters in Freiburg, including transportation, is approximately equal to that of an academic year on the University campus.

Study In Bologna. The University sponsors a program of summer study in Bologna, Italy. The program begins in mid-June and ends in the last week of August. The program is staffed primarily by members of the faculty of the University. The curriculum consists of regularly scheduled University courses on subjects in which the Italian location contributes significantly to the student's understanding and experience. Field trips to major cultural centers in Italy are an integral part of the program. Any student in good academic standing at his college or university is eligible to enroll. He will be expected to take two of any of the three courses in the fields of Art, History, Italian, Government and Music. Cost to the student in 1970 was approximately \$875. Enrollment is limited.

Madrid Summer Seminar. The University's program of advanced studies in Spanish literature is designed primarily for graduate students, but is open to well-qualified undergraduates who have completed a minimum of three years of college Spanish. The Seminar offers two graduate seminars and two advanced courses in literature and history of ideas, as well as one undergraduate course in art (taught at the Prado). Each course is given for three credits. Graduate students elect one seminar and one course, or two seminars; undergraduates take two courses. Classes are taught by prominent Hispanists from Spain or Latin America, and will be supplemented by a number of lectures on contemporary Spanish literature, music, and art. Integrated into the program, which will run from June 18–August 13, are three weekend cultural excursions and an optional, post-seminar tour of southern Spain. Students will be housed in selected Spanish homes. Cost to the student in 1970 was \$905 (\$875 to Massachusetts residents).

Oxford Summer Seminar. A special group of courses in English literature will be regularly offered at Trinity College, Oxford during the months of July and part of August. The six-week session corresponds with the regular session on the campus of the University of Massachusetts and awards University of Massachusetts credit. But the courses are all taught by Oxford dons (current or past) and the Bodleian Library is available for extensive research. Graduate and undergraduate courses are offered and vary each year according to the availability of specialists at Oxford and the interests of students. Special evening lectures by noted authorities supplement these course offerings. Overall cost to the student in 1970 was \$820.

THE GRADUATE SCHOOL

Graduate work leading to the Doctor of Philosophy degree may be taken in the following fields: Agricultural and Food Economics, Agricultural Engineering, Animal Science, Anthropology, Astronomy, Biochemistry, Botany, Business Administration, Chemical Engineering, Chemistry, Civil Engineering, Com-

parative Literature, Economics, Electrical Engineering, English, Entomology, Environmental Engineering, Food Science and Technology, Forestry and Wood Technology, French, Geology, Germanic Languages and Literature, Government, History, Human Movement, Industrial Engineering, Mathematics, Mechanical Engineering, Microbiology, Nutrition and Food, Ocean Engineering, Philosophy, Physics, Plant Pathology, Plant Science, Polymer Science and Engineering, Psychology, Sociology, Soil Science, Spanish, Speech, Wildlife and Fisheries Biology, and Zoology.

A cooperative Ph.D. program involving Amherst, Mount Holyoke, and Smith Colleges and the University is also available in all the departments of the biological sciences and the Departments of Chemistry, French, Geology, German, Philosophy, Physics, and Spanish.

The School of Education offers several specialized programs leading to the Doctor of Education degree for those employed in the educational field. The requirements for this degree follow closely those outlined for the Doctor of Philosophy degree except that in place of the foreign language requirement the candidate may demonstrate a mastery of fundamental statistics and computer language and operation. Residency must be met by attendance on campus for two consecutive semesters.

The following departments offer major work leading to a master's degree: Accounting, Agricultural and Food Economics, Agricultural Engineering, Animal Science, Anthropology, Art History, Astronomy, Botany, Business Administration, Chemical Engineering, Chemistry, Civil Engineering, Comparative Literature, Computer Science, Dramatic Arts, Economics, Education, Electrical Engineering, English, Entomology, Environmental Engineering, Fine Arts, Fisheries Biology, Food Science and Technology, Forestry and Wood Technology, French, Geology, Germanic Languages and Literature, Government, Hispanic Languages and Literature, History, Home Economics, Human Development, Industrial Engineering, Labor Studies, Landscape Architecture, Linguistics, Management Science, Marine Sciences, Mathematics, Mechanical Engineering, Microbiology, Music, Nursing, Nutrition and Food, Ocean Engineering, Philosophy, Physical Education, Physics, Plant and Soil Sciences, Plant Pathology, Polymer Science and Engineering, Psychology, Public Health, Slavic Languages and Literature, Sociology, Speech, Statistics, Wildlife and Fisheries Biology, and Zoology.

Holders of undergraduate degrees desiring further information should write for a Graduate School Catalog to: Dean of the Graduate School, Munson Hall, University of Massachusetts, Amherst, Massachusetts 01002.

SUMMER SESSION

The Summer Session at the University enables a student to earn almost the equivalent of a full semester's work in twelve weeks. (The 1970 Summer Session was six weeks in duration.) The Summer Session is open to freshmen who wish to begin their college education immediately upon graduation from high school, thus making it possible to obtain a degree in three calendar years in-



stead of the usual four. For students who plan to continue their education in graduate school or professional school, the Summer Session offers an opportunity to reach these goals earlier. This accelerated program provides some financial saving. Students who are in financial need are encouraged to make use of low-cost loans to complete their education.

Students who begin their college careers in the summer are advised to plan their programs carefully with the aid of their advisers. Normally, it is wise to plan to take the required courses during the summer, and to take electives and major courses during the fall and spring semesters. Sequential required courses are generally offered during both of the main semesters, so that work begun in the summer can be completed during the fall semester. Similarly, work begun in the spring semester can in most cases be completed in the summer following.

The Summer Session also serves the needs of other groups. Students who are currently enrolled in other colleges can come to the University to do college

work in the summer. Graduate students are offered courses which enable them to continue their education through the calendar year. Professional workers are offered courses in their specialized fields. A bulletin describing the entire summer program is available from the Registrar's Office early in the spring of each year.

FIVE COLLEGE COURSES

Amherst, Mount Holyoke and Smith Colleges and the University of Massachusetts have for some time combined their academic activities in selected areas for the purpose of extending and enriching their collective educational resources. They have been joined by newly-established Hampshire College. Certain specialized courses not ordinarily available at the undergraduate level are operated jointly and open to all. In addition, a student in good standing at any of the institutions may take a course, without cost to the student, at any of the others if the course is significantly different from any available to him on his own campus, and he has the necessary qualifications. The course must have a bearing on the educational plan arranged by the student and his adviser. Approvals of the student's adviser and the Academic Dean of the College (Provost at the University) at the home institution are required. Permission of the instructor is required for students from other campuses if permission is required for students of the institution at which the course is offered.

Students should apply for interchange courses at least six weeks prior to the beginning of the semester since they may find some courses already filled after that time. Free bus transportation among the institutions is available for interchange students.

Students interested in such courses will find current catalogs of the other institutions in departmental offices, the Library, and the Office of the Registrar. Application forms may be obtained from the Office of the Provost.

REGIONAL STUDENT PROGRAM

The University participates in a regional cooperative program administered by the New England Board of Higher Education. This program, known as the Regional Student Program, permits qualified residents of the New England states to study with in-state tuition and admission privileges at any of the state universities, the Lowell Technological Institute, and the public two-year colleges and technical institutes in a wide variety of study areas.

Detailed information about this exceptional program can be obtained through the University's Admissions Office, or from any guidance counselor, or from the New England Board of Higher Education, 20 Walnut Street, Wellesley, Massachusetts 02181.

The purpose of the program is to expand opportunities for higher education for New England residents by making available on an equal basis to all those courses not commonly offered at every institution. This practice tends to reduce duplication of courses and thus to utilize most efficiently the higher educational facilities in each state.



Schools and Colleges of the University

Undergraduate major programs are available in the following areas:

College of Agriculture

Agricultural Business Management
Agricultural and Food Economics
Agricultural Engineering
Animal Sciences
Entomology
Environmental Sciences
Fisheries Biology
Food Science and Technology
Forest Management

Hotel and Restaurant Administration
International Agriculture
Landscape Architecture
Park Administration
Plant and Soil Sciences
Plant Pathology
Pre-Veterinary
Wildlife Biology
Wood Technology

Areas of concentration within those listed may be chosen with the approval of the department head or the Dean.

College of Arts and Sciences

Afro-American Studies

Anthropology

Art

Astronomy (Five College Cooperation Program)

Economics

English

French

Geography

Geology

German

Government

History

Italian

Journalistic Studies

Latin (Five College Cooperation Program)

Mathematics

Biochemistry

Botany

Chemistry

Classics (Five College Cooperation Program)

Microbiology

Music

Philosophy

Physics

Pre-Dental

Pre-Medical

Pre-Veterinary

Psychology

Russian

Sociology

Spanish

Speech

Zoology

School of Business Administration

Accounting

General Business

Business Administration and Economics

Financial Management

Urban and Regional Studies

General Management

Business Administration and Quantitative Methods

Public Relations Management

Systems Management

Personnel Management and Industrial Relations

Production Management

Retailing

Marketing

School of Education

Education

Elementary Education

School of Engineering

Aero-Space Engineering

Chemical Engineering

Civil Engineering

Electrical Engineering

Industrial Engineering

Mechanical Engineering

School of Home Economics

Dietetics and Institutional Administration

Foods in Business

Fashion Merchandising

Child Development

Secondary Education and Extension

School of Nursing
Basic Nursing

School of Physical Education
Physical Education for Men
Physical Education for Women

Recreation

Department of Public Health
Community Health and Health Education

Environmental Health
Medical Technology

College of Agriculture

The College of Agriculture, the oldest college of the University, offers a broad general education with specific training in a specialized area. Upon the completion of the requirements for the Bachelor of Science degree, the student will have devoted his time to pure science, social and humanistic studies, and applied sciences and technology.

Undergraduate students in the College of Agriculture are exposed to an interdisciplinary, systems-oriented, problem-solving atmosphere that has been developed to a high degree.

A broad choice of electives within most of the major programs gives the student an opportunity to prepare for a career in business, industry, education, research, government, services or production agriculture.

A unique feature of the College of Agriculture is that the faculty for all the major programs is drawn from the three divisions of the College—research, resident teaching and extension, thereby bringing a depth of teaching to every student.

All departments—Agricultural & Food Economics, Agricultural Engineering, Entomology, Food Science & Technology, Forestry and Wildlife Management, Landscape Architecture, Plant Pathology, Plant & Soil Sciences and Veterinary and Animal Sciences offer

graduate degrees in a discipline or professional field.

INTERNATIONAL AGRICULTURAL STUDIES (Interdepartmental Program). The unprecedented increase in the human population of the world makes mandatory rapid increases in world food production. Estimates indicate that total food production must double by the year 2000 to maintain our current inadequate nutritional levels and must triple if reasonable improvement is to be accomplished.

Students in this program will prepare themselves for careers in foreign agricultural development and trade. Students will be trained for international careers in the several technical fields within agriculture, in administration of agricultural programs, and in agribusiness. The program will require five years to complete, including a required year abroad in a developing country during the fourth year, and leads to a Bachelor of Science degree with a major in International Agriculture. A total of 132 credit hours, including six awarded for the overseas training and six for language certification, will be required for graduation.

In addition to University core curriculum requirements and professional courses in their individual majors, students will use electives to take the follow-

ing recommended courses. (For Freshman year curricula, see major program for required Freshman courses.)

Agricultural and Food Economics 110 and 381

Sociology 101 and 252

Anthropology 104 and 379

Geography 255

Economics 266

Government 130

Certification of ability in the non-English language spoken in the region of the student's overseas training experience.

The year abroad will include language study and supervised work experience in a developing country. Certification of language ability is required.

The program also involves farm work experience and participation in pre-departure orientation for year-abroad students.

STOCKBRIDGE SCHOOL. For those students interested in a two-year Associate Degree program in the food and agricultural industries, the University provides offerings in the Stockbridge School. A separate bulletin describes these offerings in detail.

MAJOR PROGRAMS IN THE COLLEGE OF AGRICULTURE, B.S. DEGREE, ARE AS FOLLOWS:

AGRICULTURAL BUSINESS MANAGEMENT

Growing demand for food and fiber products, both for domestic and foreign consumption, increases the importance of planning and management in the production and marketing of these products.

Agricultural Business Management focuses upon the application of principles of economics and business management to the problems of supplying agricultural businesses and the production and marketing of agricultural products.

The rapidly changing agricultural industry offers increasing opportunities for students with specialized training in business and economics, as executives of marketing firms, farm supply organizations and food processing concerns. There are many other opportunities available to graduates in teaching and research and in administrative positions and public service.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
*Math. 111, 121 or 123	
Introductory	3
†Natural Sci.	3
‡Social Sci.	3
Agric. & Food Economics 110	3
Rhetoric 100	3
	—
	15

<i>Second Semester</i>	<i>Credits</i>
Math. 113, 123 or 124	
Introductory	3
†Natural Sci.	3
‡Social Sci.	3
Rhetoric Elective	3
§Elective	3
	—
	15

*On basis of placement tests at time of summer counseling Alg. & Trig. 121—(Not open to students having entrance credits in Trig.)

†Choose from Chem. 111 & 112, Physics 103 & 104, Bot. 100, Zool. 101, Microbiol. 150, and Astron.

‡Choose from Gov. 100 & 150, Hist. 100, 101, 150, & 151, Psych. 105 & 106, and Sociol. 101 & 102.

§Recommendations for some elective courses are made from the fields of Economics, Business and Technical Subjects in Agriculture, depending upon the interests of the individual student.

AGRICULTURAL AND FOOD ENGINEERING

This professional field includes engineering activities which relate macrophysical and microphysical environments to the production, preservation, and processing of food and other biological materials. The academic program is quantitative in nature and emphasizes the integration of mathematics and the physical sciences into the interpretation and solution of biological production and processing problems. Agricultural engineers find professional employment in a variety of industries as well as in public and private agencies engaged in research and development.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Rhetoric 100	3
Mathematics 123, Anal.	
Geom. & Calculus	3
Chemistry 111	3
Engr. 103, Graphics	3
Social Science Elective	3
Physical Education 100	1
	—
	16

<i>Second Semester</i>	<i>Credits</i>
Rhetoric Elective	3
Mathematics 124, Anal.	
Geom. & Calculus	3
Chemistry 112	3
Engr. 104, Problems	2
Physics 161, General	4
Physical Education 100	1
	—
	16

ANIMAL SCIENCES AND PRE-VETERINARY

The curriculum in the Animal Sciences, including poultry, is designed to provide fundamental training and knowledge in the comparative nutrition, physiology, genetics, and management of various classes of livestock and to understand the role of animal production in the national and world economy. Options emphasizing commercial animal production are supported by electives in agricultural economics, agricultural engineering, and business administration. Students interested in graduate work in such specialized areas of the animal sciences as nutrition, physiology or genetics should elect programs with stress on the sciences.

Freshmen pre-veterinary students in the College of Agriculture usually major in Animal Science, but may choose other departments if appropriate to the students' interests. Those who by their work in the first year demonstrate a potential for success should apply to the Pre-Professional Advisory Committee for admission into the pre-veterinary program (see page 85 under heading Pre-Dental, Pre-Medical, etc. for additional information). All pre-veterinary students, regardless of major, are counselled by the pre-veterinary advisor in the Animal Science Department.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Animal Sci. 121 Introduct.	3
Botany 100 General	3
Chem. 111 General	3
*Math.	3
Rhetoric 100	3
	—
	15

<i>Second Semester</i>	<i>Credits</i>
Zool. 101 General	3
Chem. 112 General	3
Math. 112 Finite	3
Social Sci.	3
Rhetoric Elective	3
	—
	15

*On basis of placement tests at time of summer counseling.

ENTOMOLOGY

Courses in Entomology acquaint students with all phases of insects and insect control, including apiculture and medical entomology. Trained entomologists find positions in public service and industry, such as teaching at all levels; research, quarantine and regulatory work in state or Federal service, various roles in public health and pest control activities; research, sales and public relations work in the agricultural chemicals industry; and agriculture.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Chem. 111 General	3
Zool. 101 Introductory	3
*Math.	3
Foreign Language or Agric.	
& Food Econ. 110	3
Rhetoric 100	3
	—
	15

<i>Second Semester</i>	<i>Credits</i>
Chem. 112 General	3
Entomol. 126 General	3
Math. 112 Finite	3
Foreign Language or	
Botany 100 Introductory	3
Rhetoric Elective	3
	—
	15

*On basis of placement tests at time of summer counseling.

ENVIRONMENTAL DESIGN

The Environmental Design program prepares students for professional study at the graduate level and also provides an introduction to problems of the design of the physical environment for those not intending to pursue graduate study. Options are offered in pre-planning and pre-landscape architecture which afford students the opportunity to prepare for graduate study in either of these professions.

Landscape architects and planners find employment in many public agencies responsible for the design and planning of the physical environment. These include those dealing with parks and open-space systems, housing, urban renewal, and transportation systems at the national, state and local levels. They also are principals of or work in private consulting offices.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Rhetoric 100	3
*Math. 110 or 121 Alg. & Trig.	3
Gov. 100 American Gov't.	3
Art 100 Basic Drawing	3
Botany 100 Introductory	3
—	15
<i>Second Semester</i>	<i>Credits</i>
Rhetoric Elective	3
Math. 112 Finite or Math. 123	
An. Geom. & Cal. or	
Philos. 125 Introductory or	
Stat. 121 Elementary	3
Sociol. 101 Introduction	3
Art 115 History of Art	3
Zool. 101 Introductory	3
—	15

*On basis of placement tests at time of summer counseling. Note: Math. 121 cannot be taken for credit if offered for entrance.

ENVIRONMENTAL SCIENCES

The major in Environmental Sciences is designed to provide training in the assessment, qualitatively and quantitatively of environmental stress on the biota induced by air, water, and soil pollutants. It is designed both as a basis for informed social action as well as to provide an introduction to specialized studies in environmental health and engineering and environmental quality management.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Botany 100 Introductory	3
Chem. 111 General	3
Rhetoric 100 Language	3
*Math.	3
Elective	3
—	15
<i>Second Semester</i>	<i>Credits</i>
Zool. 101 Introductory	3
Chem. 112 General	3
Rhetoric Elective	3
Math.	3
Env. Sci. 301	3
—	15

*On basis of placement tests at time of summer counseling.

FISHERIES BIOLOGY

Fisheries Biology is concerned in its broadest terms with the management of the

aquatic environment in both freshwater and marine situations leading to maximum sustained yields of both sport and commercial catch. It deals with the management of resources and with fundamental factors affecting the biology of species from a research point of view.

Government, state and federal, provides the largest number of career opportunities. Educational opportunities in both secondary schools and colleges are on the increase.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Rhetoric 100 Language and	
Writing	3
Math. 110 or 121	3
Botany 100 Introductory	3
Chem. 111 Inorganic	3
Forestry 222 Cons. of	
Natural Resources	3
—	15

<i>Second Semester</i>	<i>Credits</i>
Rhetoric 110 Language and	
Speaking	3
Math. 113 Survey of Calculus	3
Zool. 101 Introductory	3
Chem. 112 Inorganic	3
Social Sci. Elective	3
—	15

FOOD MARKETING ECONOMICS

The food distribution industry is the largest single industry in the nation in terms of number of people employed and in dollar sales. The number of managerial and executive positions in the food industry is growing at a rapid rate because of the expansionary nature of the industry and the advancing state of scientific management being employed.

Abundant opportunities for career employment, having excellent prospects for advancement, are available in private industry, government, and education. Students receive basic courses in Economics, Business, and Labor management.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
*Math. 111, 121 or 123	3
†Natural Sci.	3
†Social Sci.	3
Rhetoric 100	3
Agric. & Food Econ. 110	
Food & Nat. Res.	3
—	15

<i>Second Semester</i>	<i>Credits</i>
Math. 113, 123 or 134	3
†Natural Sci.	3
†Social Sci.	3
Rhetoric Elective	3
§Elective	3
	—
	15

*On basis of placement tests at time of summer counseling. Math. 121—(not open to students having entrance credit in Trig.)

†Choose from Chem. 111 & 112, Physics 103 & 104, Botany 100, Zool. 101, Microbiology 150, and Astron.

‡Choose from Gov. 100 & 150, Hist. 100, 101, 150, and 151, Psych. 105 & 106, and Sociol. 101 & 102.

§Recommendations for some elective courses are made mostly from the fields of Economics and Business, depending upon interests.

FOOD SCIENCE AND TECHNOLOGY

A major in Food Science and Technology provides scientific and technological training in the principles concerned with the processing, preservation, and packaging of foods and food products. The student's training is directed to the application of modern science and technology to research and to the manufacturing and distribution of foods. Major fields open to graduates include: (1) product research and development; (2) food processing and packaging; (3) technological work and research in government, industry, and education; (4) advanced graduate study.

The curriculum in Food Science and Technology, of which approximately 30% of the credits are electives, is designed to provide flexibility to meet the interest and objectives of the student as well as the opportunity to obtain professional training as recommended by the Institute of Food Technologists.

Supporting courses are selected with the guidance of the major adviser and may include, among others: Agric. Eng. 386, Chem. 281, 282, Biochem. 224, Food Sci. 258, 365, 384, Microbiology, Nutrition, Statistics, and Computer Science.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Rhetoric 100 Language & Writing	3
Chemistry 111 General	3
*Math. 123 Anal.	
Geom. & Calculus	3
Zoology 101 Introductory	3
Social Science or Elective	3
	—
	15

<i>Second Semester</i>	<i>Credits</i>
Rhetoric 110 Language & Speaking	3
Chemistry 112 General	3
Math. 124 Anal. Geom. & Calculus	3
Food Sci. 101 Struggle for Food	3
Social Science or Elective	3
	—
	15

*On basis of placement tests at time of summer counseling.

FORESTRY

This major is concerned with the conservation and management, for the public benefit, of forests, park lands, and other open space through the production of wood, water, wildlife, and amenity values such as recreation and aesthetics.

The curriculum in Forestry is based on the biological and natural sciences, a knowledge of the environment, economics, and social inter-relationships. Six curricular options are offered: General Forestry, Forest Resource Conservation, Forest-Business Management, Forest Hydrology, Forest Recreation, and Forest Science.

This accredited program prepares graduates for continued education at the graduate school level, and for employment with private industry, federal and state resource agencies, secondary school education, conservation and planning organizations.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Rhetoric 100 Language and Writing	3
Math. 116 Calculus	3
Chem. 111 Inorganic	3
Botany 100 Introductory	3
Forestry 222 Cons. of Natural Resources	3
	—
	15

<i>Second Semester</i>	<i>Credits</i>
Rhetoric 110 Language and Speaking	3
Math. 117 Calculus	3
Chem. 112 Inorganic	3
Forestry 112 Dendrology	3
Elective	3
	—
	15

HOTEL AND RESTAURANT ADMINISTRATION

The curriculum in Hotel and Restaurant Administration provides technical and professional courses for persons who plan a career in ownership, management or sales in the hotel/motel, food service or related fields. In addition to the required core curriculum courses, students take courses in accounting and control; personnel and management; food planning, purchasing, preparation, and service; promotion, merchandising and sales; kitchen planning and maintenance. Emphasis is on principles, analysis, computer application and decision-making.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Hotel & Rest. Adm. 100	
Introductory	3
Rhetoric 100	3
*Science Requirement	3
Math. 110 Elementary or	
Math. 116 Calculus	3
Elective	3
	15

<i>Second Semester</i>	<i>Credits</i>
Hotel & Rest. Adm. 101	3
Nutrition & Food	
Food Prep. & Meal Planning	3
Rhetoric 110	3
*Science Requirement	3
Math. 112 Finite or	
Math. 117 Calculus	3
	15

*Elect three courses from the following "E" designated courses: chemistry, physics, microbiology, botany, zoology, entomology, statistics.

NATURAL RESOURCE ECONOMICS

The resource economics program is designed to train students to assist in making public and private decisions on resource development and management which will contribute to the twin goals of greater resource productivity and improved environment. Students will study the many problems of resource use, the forces which have combined to create these problems, and the possible solutions to these problems. Training in economic decision-making and the technical characteristics of specific natural resources provide a unique competence for performing these nationally important careers.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
*Math. 111, 121 or 123	3
†Natural Sci.	3
‡Social Sci.	3
Agric. & Food Econ. 110	3
Food & Nat. Res.	
Rhetoric 100	3
	15
<i>Second Semester</i>	<i>Credits</i>
Math. 113, 123 or 124	3
†Natural Sci.	3
‡Social Sci.	3
Elective	3
Rhetoric Elective	3
	15

*On basis of placement tests at time of summer counseling. Alg. & Trig. 121—(not open to students having entrance credits in Trigonometry).
†Choose from Chem. 101 & 112, Physics 103 & 104, Botany 100, Zool. 101, Microbiol. 150, and Astron.
‡Choose from Gov. 100 & 150, Hist. 100, 101, 150, & 151, Psych. 105 & 106, and Sociol. 101 & 102.

PARK ADMINISTRATION

Park Administration is a comparatively new specialized profession in the field of public service. A growing awareness of the importance of parks to society, to man and his environment, and their relationship to the overall economy is being recognized, thus bringing increased demands for trained administrators at the national, state and local levels.

Careers may be found in the National Park Service, Bureau of Outdoor Recreation, State, Regional, County, and Municipal park systems. Additional opportunities exist in agricultural, recreation, cemetery, golf course, industrial and educational organizations. Demand for graduates is very strong.

In addition to the core curriculum, students will take courses in Arboriculture, Botany, Economics, Entomology, Forestry, Government, Landscape Architecture and Recreation.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
*Math. 111 Introductory or	
Math. 121 Alg. & Trig.	3
Gov. 100 American	3
Chem. 100 or 111 General	3
Botany 100 Introductory	3
Rhetoric 100	3
	15

<i>Second Semester</i>	<i>Credits</i>
Math. 112 Finite or Math. 123 An. Geom. & Cal. or Philos. 125 Introductory	3
Sociol. 101 Introductory	3
Zool. 101 Introductory	3
Elective (Humanities)	3
Rhetoric Elective	3
	15

*On basis of placement tests at time of summer counseling. Note: Math. 121 cannot be taken for credit if offered for entrance.

PLANT INDUSTRY

The curriculum in Plant Industry provides students with a scientific basis of soil and plant relationships; a general knowledge of economic plants and an area of special study. By selection of option and elective courses and special problems, students major in: Agronomic Crops (i.e., Field and Forage Crops); Horticultural Crops (i.e., Flowers, Ornamentals Nursery), Fruits and Vegetables); and Turf Management. Students are prepared for a variety of career opportunities in industry, business, marketing, production, sales, control, and regulatory services in state and Federal agencies.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Botany 100 General	3
*Math.	3
Plant & Soil Sci. 110	3
Social Sci. Elective	3
Rhetoric 100	3
	15

<i>Second Semester</i>	<i>Credits</i>
Math.	3
Plant & Soil Sci. 100 Basic Plant Sci.	3
Social Sci. Elective	3
Zool. 101 Introductory	3
Rhetoric Elective	3
	15

*On basis of placement tests at time of summer counseling.

PLANT PATHOLOGY

Plant Pathology is concerned with the nature and control of plant diseases caused by fungi, viruses, bacteria, nematodes, certain higher plants and unfavorable environmental conditions. Plant pathologists fill positions in public service and in industry, such as

teaching at all levels; research in state, Federal, university, and industrial laboratories and experiment stations; and Extension Service through Federal, state and county organizations. They are also employed in quarantine and regulatory work, in various roles in plant disease control, and in sales and public relations work.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
*Math.	3
Chem. 111 General	3
Botany 100 General	3
Foreign Lang. or Agri. & Food Econ. 110 Food & Nat. Res.	3
Rhetoric 100	3
	15

<i>Second Semester</i>	<i>Credits</i>
Math. 112 Finite	3
Chem. 112 General	3
Zool. 101 General	3
Elective	3
Rhetoric Elective	3
	15

*On basis of placement tests at time of summer counseling.

PLANT SCIENCE

In today's world there is a great need for highly trained men in the plant sciences who are available to teach and study the fundamental physiology and genetic processes taking place within plants. A more complete understanding of these processes and the influence of environmental factors upon them will lead to a significant improvement in the supply and quality of plant food and fiber. Students who are interested in such careers as: Plant Breeder and Geneticist, Secondary and College teaching, research and resource development and like professions should major in Plant Science. This option is designed to provide the breadth and depth in basic biological and physical sciences and mathematics necessary for graduate study.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Botany 100 General	3
Chem. 111 General	3
*Math.	3
Plant & Soil Sci. 110 Plant Propagation	3
Rhetoric 100	3
	15

<i>Second Semester</i>	<i>Credits</i>
Chem. 112 General	3
Math.	3
Social Sci. Elective	3
Plant & Soil Sci. 110	
Basic Plant Science	3
Rhetoric Elective	3
	15

*On basis of placement tests at time of summer counseling.

SOIL SCIENCE

Soil science deals with the physical, chemical and biological properties of soils as well as their relationship with higher plants. Men trained in this area become soil chemists, soil physicists, soil microbiologists, hydrologists and soil conservationists. Graduate study is mandatory for professional careers in soils and the soils curriculum is designed to provide the necessary breadth and depth in biological and physical sciences and mathematics for graduate study.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Botany 100 General	3
Chem. 111 General	3
*Math.	3
Plant & Soil Sci. 110	
Plant Propagation	3
Rhetoric 100	3
	15

<i>Second Semester</i>	<i>Credits</i>
Chem. 112 General	3
Math.	3
Social Sci. Elective	3
Plant & Soil Sci. 100	
Basic Plant Science	3
Rhetoric Elective	3
	15

*On basis of placement tests at time of summer counseling.

WILDLIFE BIOLOGY

The first professional degree in Wildlife Biology is the Master of Science; for this reason study toward the Bachelor of Science in Wildlife Biology should be regarded as pre-professional. Students planning to enter graduate school are urged to meet with their

advisers to select electives and plan their courses of study accordingly.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Rhetoric 100 or 110	3
*Math. 112 or 116	3
Chem. 111, General	3
Botany 100, Introductory	3
Forestry 222, Conservation	3
	15

<i>Second Semester</i>	<i>Credits</i>
Rhetoric 110 or 100	3
Math. 113 or 117	3
Chem. 112, General	3
Zoology 101, Introductory	3
Economics 125, Elements	3
	15

*On basis of placement tests at time of summer counseling.

WOOD SCIENCE AND TECHNOLOGY

The program in Wood Science and Technology emphasizes studies in the nature and properties of wood, the engineering and chemical technology of its manufacture into a variety of useful products, and the business aspects of industrial management and marketing. Strong demands exist for graduates in wood-processing firms and service-related industries, and in marketing and merchandising.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Rhetoric 100 Language and Writing	3
Math. 123 Calculus	3
Botany 100 Introductory	3
Chem. 111 Inorganic	3
Engineering 103 Graphics	3
	15

<i>Second Semester</i>	<i>Credits</i>
Rhetoric 110 Language and Speaking	3
Math. 124 Calculus	3
Forestry 112 Dendrology	3
Chem. 112 Inorganic	3
Engineering 104 Problems	2
	14

College of Arts and Sciences

The College has programs of study leading to four bachelor's degrees: Bachelor of Arts, Bachelor of Science, Bachelor of Fine Arts, and Bachelor of Music. All departments offer a program leading to the B.A. degree. The B.S. degree may be earned only if the major is mathematics, science, or psychology. The B.F.A. programs have a strong emphasis in art and the Bachelor of Music programs reflect an emphasis in music. All of the degree programs combine a study in depth in one area with supporting study in the other two of the three main divisions: (a) Fine arts and humanities, (b) Social and behavioral sciences, and (c) Natural science and mathematics. Courses appropriate to the distribution requirements in these three areas are noted in University Catalogs by the respective codes (C), (D), and (E).

A program of study which conforms with the following five provisions qualifies the student who completes it for the appropriate degree. Advanced placement and transfer credits may be applied toward any or all of these qualifications; but at least half of the major program must be completed in residence.

1. At least 120 credits in addition to course work applicable to the University Physical Education requirement must be completed; of these no more than four may be in applied music except for a student whose major is music.

2. A basic proficiency or experience in communicative skills must be achieved by completing six credits in rhetoric; the two rhetoric courses must include at least one of Rhetoric 100 or 110.

3. For the B.A. and B.S. degrees only, a basic proficiency or experience with foreign language must be demonstrated by (a) completion of a foreign language course at the college fourth-semester level, (b) a satisfactory performance on an achievement or placement test, (c) four entrance units in one foreign language or three units in one

and two units in another foreign language, (d) a year in a school in which English is not the basic language, or (d) an approved substitution of language related study if there is clearly demonstrated difficulty in language study which has been approved by the foreign language board.

4. Distribution is achieved by completion of courses in each of the two divisions of the College other than the one in which the major falls. With the understanding that work in the major is applicable to one or more of these divisions, this qualification is stated for all three divisions and all degrees as:

Division	Core Code	Number of Courses for			
		B.A.	B.S.*	B.F.A.	B. MUS.
Fine Arts and Humanities	(C)	4	3	4	4
Social and Behavioral Sciences	(D)	4	3*	3	3
Natural Science and Mathematics	(E)	4	4*	4	4

*To qualify for a B.S. degree, at least 60 credits must be earned in science, mathematics, and/or psychology courses; distributional courses may be part of this minimum of 60.

5. An approved major program of the College must be completed. The traditional departmental major programs are the most common, and they are described in the following pages. A few others are specified and administered by standing committees of the faculty and are described below. Several other interdisciplinary programs are being worked on at this time. All major programs have these features in common: (a) faculty guidance, (b) a coherent program of study made up of at least 24 credits, at least 15 of which must be in upper division courses in this College, and (c) the student has at least 12 completely free electives.

Advisory System:

When a student elects a special major, or is admitted to a specialized degree program, he is assigned a faculty adviser from that major. The faculty adviser helps the student choose his program of study and also serves as a communication link between the student and the Registrar's Office. The student may choose a specific major on entrance or he may postpone this choice until his fourth semester. Until he chooses a specific major, he is listed as a College of Arts and Sciences major and the College of Arts and Sciences Information and Advising Center (CASIAC) serves as the student's adviser. Faculty members from a broad selection of disciplines form the staff of CASIAC and the student may continually meet with the same staff member or he may talk with whomever is on duty at the time. A primary goal of the Center is to help the student choose a major which is consistent with his interests and potentialities.

A student has considerable freedom in choosing his program of study and his major. However, a few of the major programs require sequences of courses which extend over seven or eight semesters. A student who does not take the right courses in his freshman year may have to use a summer session or extra semesters to accommodate these sequences if his ultimate major is Astronomy, Biochemistry, Chemistry, Mathematics or Physics, or if he is in the Bachelor of Music or Bachelor of Fine Arts program. Some standard freshman year programs are:

Bachelor of Fine Arts:

Rhetoric
Introduction to Art
Studio Art
Physical Education

and two of the following:

Math or Science
Humanity
Social Science

Social Science (B.A. or B.S.):

Rhetoric
Social Science
Physical Education

and three of the following:

Foreign Language
Humanity or Fine Art
Math or Science
Second Social Science

Mathematics (B.A. or B.S.):

Rhetoric
Math (Calculus)
Science
Physical Education

and two of the following:

Foreign Language
Social Science
Humanity

Bachelor of Music:

Rhetoric
Music Theory
Music Literature
Physical Education

and two of the following:

Math or Science
Social Science
Humanity, other than Music

Humanity (B.A.):

Rhetoric
Humanity or Fine Art
Physical Education

and three of the following:

Foreign Language
Social Science
Math or Science
Second Humanity

Science (B.A. or B.S.):

Rhetoric
Chemistry or Physics*
Math (Calculus, if prepared)
Physical Education

and two of the following:

Foreign Language
Humanity

Social Science
Second Science

*Chemistry majors elect Chemistry 113; Biology and Geology majors elect Chemistry III; and Physics and Astronomy majors elect Physics 181.

LATIN AMERICAN STUDIES PROGRAM

Undergraduates interested in Latin America may enroll in the Latin American Studies Program. The Program does not constitute a major and is designed to supplement the work done in a regular discipline. However,

those students who fulfill the requirements of the Program will be awarded the Certificate in Latin American Studies attesting to their attainment in area and language studies. To earn a certificate a student must 1) satisfactorily demonstrate a practical working knowledge of Spanish or Portuguese and elementary proficiency in the other, 2) satisfactorily complete four courses focused on Latin America, and 3) participate in the Interdisciplinary Seminar on Latin America. The requirements of the Program are to be met partly through courses that fulfill existing requirements of the College and partly through the careful use of electives.

The Committee on Latin American Studies administers the Program and advises interested students. Members of the Committee are: R. L. Bancroft, (Spanish); R. A. Potash, Chairman, (History); D. Proulx, (Anthropology); F. B. Sherwood, (Economics); and H. A. Wiarda, (Government).

PRE-DENTAL, PRE-MEDICAL, AND PRE-VETERINARY PROGRAMS

A student planning to enter a dental, medical, or veterinary school should select a major department in the field of most interest to him. This will usually be in the College of Arts and Sciences but may be in other colleges or schools. Pre-Veterinary students frequently select a major in the College of Agriculture. Preparation for the professional schools requires relatively few specific courses beyond those necessary to obtain the bachelor's degree and can be completed within the four-year curriculum of most departments in the University.

A liberal education is felt to be one of the best backgrounds for entering the medical or dental field. Although many students may be inclined to concentrate in the sciences, this will not necessarily improve the opportunity for entrance into a professional school. Rather, the field of concentration should be determined by the student's strong secondary interests; i.e., he should choose that area most likely to lead to a satisfying alternative career.

Minimum preparation for the pre-professional student should include one year of inorganic, one year of organic, and one semester of analytical chemistry, three semesters of biology, one year of college mathematics, and one year of physics. Certain additional courses in biology, chemistry, or mathematics, as well as a foreign language may be required by some dental, medical,

and veterinary schools. Students should consult their advisers as well as professional school catalogs in regard to specific requirements of particular schools. Freshmen who intend to include the pre-professional courses in the curriculum should discuss their plans with the summer counseling adviser as some change in the normal course sequence may be desirable.

Students, who by their work in the first year, demonstrate a potential for success may, in their third semester, apply to the Pre-Professional Advisory Committee for entrance into the pre-medical, pre-dental, or pre-veterinary major. This program is designed to give qualified students the opportunity to broaden their background by providing for increased flexibility in the curriculum of the last two years. These students will have advisers specifically for this program, will be interviewed in the sophomore and junior years, and, upon application to medical school, will be given a written evaluation by the pre-medical committee. However, admission into a pre-medical, pre-dental, or pre-veterinary program is not a prerequisite for application to the professional schools. Many students prefer to complete a full major in an academic department; these students should also apply for entrance into the pre-professional program, and they will be interviewed and evaluated in the same manner as those who are accepted as majors.

A file of dental, medical, and veterinary school catalogs and other pertinent material is maintained in the committee office, Room 409, Hasbrouck Laboratory. Students are encouraged to visit this office for further information concerning preparation for careers in dentistry, medicine, and veterinary medicine.

Individual members of the advisory committee are available for counsel to all interested students at any stage of their program and whether or not they have been accepted into the curriculum as majors. The committee membership for 1970-71 consists of the following: H. E. Bigelow (Botany), B. C. Crooker, Chairman (Physics), E. L. Davis (Botany), R. S. Feldman (Psychology), L. D. Lavalley (Mathematics), E. J. McWhorter (Chemistry), J. H. Nordin (Biochemistry), G. J. Oberlander (Chemistry), W. B. O'Connor (Zoology), H. Rauch (Zoology), R. E. Smith (Veterinary and Animal Sciences), M. S. Wilder (Microbiology).

PRE-LAW ADVISING PROGRAM

The Pre-Law Advising Program was instituted to provide information to students on career opportunities in the legal profession and requirements for admission to law school. Law schools are not as specific as medical schools concerning the preparation for admission; consequently there is no pre-law major at the University. Interested students are urged to register with the Pre-Law Adviser, Richard E. Conklin, Room 153, South College. Current catalogs from every accredited law school in the United States in addition to other materials pertaining to the legal profession are available in his office.

HONORS PROGRAM

The College of Arts and Sciences Honors Program offers unusual opportunities for the superior student who is willing and able to engage himself seriously in the learning process. The features of the program are, briefly, as follows:

1. an individualized schedule of studies;
2. thoughtful guidance by a preceptor, a specially selected professor;
3. special honors courses.

The student who is admitted to the program is referred to as a Commonwealth Scholar. Each Scholar prepares with the aid of his preceptor a plan of studies designed to meet the student's abilities, interests, and needs. Although this plan should provide both general education and, in time, an area of concentration, a Commonwealth Scholar need not meet the usual College and University requirements as set forth in this *Bulletin*, except for physical education, the 120 credits required for graduation, and a major.

An important feature of the honors program is the guidance provided by the Commonwealth Scholar's preceptor. Each preceptor is a member of the faculty especially interested in working closely with serious and able students. His responsibilities include not only helping select courses but also guiding the student's intellectual development. Among the preceptors are some of the most distinguished members of the faculty as well as younger professors of great ability.

The junior-senior honors credits may be obtained from honors interdisciplinary seminars, special honors projects, honors courses in one's major (where available),

and in University honors colloquia. In addition to the special honors courses, a rich offering of studies is available from the University's several undergraduate colleges and schools with their hundreds of courses, from the graduate program, from special honors sections of courses, and from the offerings of Amherst, Smith and Mount Holyoke Colleges through the Five-College Cooperation program.

The College of Arts and Sciences Honors Program is open by invitation only. Chairman of the program is Dr. Everett H. Emerson; Assistant Chairman is Dr. Brian O'Connor. Offices are in Machmer Hall. The College Honors Committee includes Drs. Doris Abramson, Earl McWhorter, Howard Quint, T. O. Wilkinson, W. B. O'Connor, and E. H. Emerson.

ANTHROPOLOGY

Courses in anthropology are planned to give the student an understanding of man's evolution and place in the animal kingdom: of his cultural heritage and social behavior, including speech; and of the relationships which occur among these. The student is further introduced to the fundamental methods of anthropological research and to the major theoretical approaches in the field. The course offerings are designed so that students who desire to prepare for graduate work, as well as those who do not, will find suitable programs for study available within the department.

Anthropology majors must take Anthropology 104 and any one of the other three introductory anthropology courses: 102, 103, and 105. They must further take a course in one of the following social sciences: Economics, Government, Psychology, and Sociology. They are strongly urged to select Zoology 101 and Geology 101 in partial fulfillment of their science requirement. All majors are also required to elect a minimum of 21 credits and a maximum of 27 credits above the 100-level in anthropology. With the approval of the departmental advisory committee, an anthropology major may be allowed to substitute as part of this requirement up to nine credits in sociology or non-duplicating courses in anthropology given at one of the cooperating valley institutions. Given the wide-ranging scope of anthropology, a broad background in the arts and sciences is strongly encouraged.

Since fieldwork is an essential component of anthropology, field and/or lab-

oratory experience is expected of graduate students and is also available and encouraged, on a more limited scale, during the undergraduate program.

Career opportunities for students of anthropology are open in private and public institutions and organizations, and include teaching and research.

ART

The Department of Art offers two programs serving a range of objectives. The first of these leads to a Bachelor of Arts degree with a major in Art and is designed to provide a good general historical and aesthetic knowledge of the arts while affording an opportunity to develop creative ability in the several media. Under the B.A. degree program there are three majors: Studio Art, Art History, and a combination of both.

The other program is of a professional nature and leads to a Bachelor of Fine Arts degree. Under this program there are five major areas: Art Education, Painting, Sculpture, Printmaking, and Ceramics. A student who wishes to major in the B.F.A. program must first pass the B.F.A. entrance test. The B.F.A. test is given here on campus throughout the academic year, and provides the department with a small portfolio of drawing and design from each student. This test may be taken before admission to the University or during the student's first year in residence, after the student has already been admitted as a B.A. art major. To graduate under this program, a 2.5 grade point average is necessary on any college work and a 3.0 in art courses by the end of the student's senior year.

ASIAN STUDIES

There is no major program in Asian Studies, but the chairman can help students arrange a comprehensive and correlated series of courses dealing with the Far East. This provides an interdisciplinary approach and, at the same time, permits flexibility in student programs. Beginning, intermediate, and advanced Chinese and Japanese language courses are offered. There is a wide range of courses relating to Asia currently available on the University campus and elsewhere within the Five Colleges. Included in the offerings of many departments are courses relating to contemporary Asia.

ASTRONOMY

(Also see *Physics*)

The Five College Department of Astronomy is administered jointly with Amherst, Hamp-

shire, Mount Holyoke, and Smith Colleges. The elementary courses for non-majors are taught separately at each campus but all advanced courses are given on a joint basis for students from the five participating institutions. Five College courses are identified in the Undergraduate Catalog by ASTFC. The Astronomy Program at the University is also a part of the Department of Physics and Astronomy. The graduate program in astronomy is developed in close cooperation with the program of physics.

The Five College Astronomy Department offers undergraduate courses which furnish 1) specialization for those students planning graduate study in astronomy, 2) a more general major for students interested in careers in teaching, scientific journalism, technical editing, or similar areas for which astronomy may form the basis for a suitably broad science background, and 3) a background for all students who are interested in astronomy for its cultural and scientific value. Professor T. T. Arny is the Chief Adviser for Astronomy.

Students who plan to go to graduate school should obtain a firm foundation in physics and mathematics and should plan to finish satisfactorily Physics 184 and 163, Mathematics 174 or 186, and Astronomy 122 by the end of the sophomore year. During the junior and senior years a student must complete Physics 255-256 and Physics 251-252, Mathematics 343, and three courses selected from Astronomy 237, 238, 343, 344, and independent study. It is also strongly recommended that the student take Mathematics 341, Physics 271-272 and/or 285-286, and obtain a good reading knowledge of German, French or Russian.

More flexibility in planning courses is available to those majors for whom the B.A. or B.S. will be a terminal degree in astronomy. In some circumstances Physics 142 and Astronomy 101-102 will be acceptable lower division courses. A minimum of three upper division astronomy courses and six additional credits of upper division astronomy or physics must be satisfactorily completed. These may include Astronomy 231 and 234 but should be chosen in consultation with the Chief Adviser. In some cases advanced courses in the history or the philosophy of science may be desirable.

Those students wishing a B.S. rather than a B.A. degree need a total of 60 credits of science courses. The credits required beyond those explicitly needed for the astronomy major may be chosen from any

science or behavioral science courses.

Independent and honors work are encouraged for all majors. Opportunities for theoretical and observational work are available in cosmology, cosmogony, radio astronomy, planetary atmospheres, relativistic astrophysics, laboratory astrophysics, gravitational theory, infrared balloon astronomy, stellar astrophysics, spectroscopy, and exobiology. Facilities include the Laboratory for Infrared Astrophysics, balloon astronomy equipment (16-inch telescope, cryogenic detectors), the Five College Radio Observatory, access (under supervision) to the 120-foot NEROC radio antenna, and a modern 16-inch Cassegrain reflector. Opportunities for summer research are also frequently available including an exchange program with the Observatory of Bonn University. Original publications often result from undergraduate research.

BIOCHEMISTRY

The biochemistry major provides a curriculum for those students who have an interest in both biology and chemistry and who wish to achieve a balanced and mutually supporting education in these two areas. Formal education in biochemistry is started with the general biochemistry course in the junior year and continued by requiring advanced tutorial and/or honors programs in the senior year. Professor T. Robinson is Chief Adviser.

For students who, early in their college years, already plan on graduate school and a professional career in biochemistry, this major would be an obvious choice. At present, most students arrive in graduate school to study biochemistry with no background in the subject and must spend a full year before they even have the background for deciding on an area of interest. This major would be valuable for students going into many areas of molecular biology.

For pre-medical, pre-dental, and pre-veterinary students a major in biochemistry would have many attractions. It is well-known that undergraduate experience in biochemistry and related fields can soften the difficult first year of medical school. Furthermore, a movement toward flexibility in the medical curriculum has been developing. A student who majors in biochemistry can look forward to exemption from biochemistry at growing numbers of medical schools with consequent free time for elective research, other courses, etc.

An undergraduate major in biochem-

istry could be valuable for future junior college and secondary school science teachers who may be expected to have competence in several areas of science. Finally, students who are merely undecided between chemistry and biology may find that a major in biochemistry will provide them with the background for a decision. The curriculum outlined below is flexible enough to allow a student to change his major to biology or chemistry as late as the end of the sophomore year without finding that he has deficiencies to be made up. In addition, the informal discussions during the freshman and sophomore years will provide him with guidance in his final choice of major.

The sample curriculum outlined below conforms to college requirements and closely follows recommendations made at the 1965 Symposium on Pregraduate Education in Biochemistry of the American Society of Biological Chemists.

First Year: Chemistry 113-114, Mathematics 123-124, Elementary Biology I-II, German 110-120, Rhetoric 100 or 110.

Second Year: Chemistry 165-166 or 261-262, Chemistry 167 or 263-264, Mathematics 173-174, Physics 103-104, German 130, 140 and English 125-126.

Third Year: Biochemistry 223-224, Biochemistry 225-226, Chemistry 210 (I)—Elem. Biol. Sci. (II), Chemistry 281-282 or 285-286, Social Sciences (I, II), Humanities (I, II), Computer Science (II).

Fourth Year: Two advanced courses in chemistry or biology, Advanced Biochemistry (including lab.) 5 cr. (e.g. Bio. 388 or 399), Social Science (I or I, II).

BOTANY

Programs in Botany prepare students for teaching and research in biological sciences in high schools, universities, industry and experimental stations. Majors who expect to prepare for graduate training in Botany (other than that in preparation for secondary school teaching) must take:

Chemistry 111-112

Chemistry 261-262, 263, 264; or Chemistry 160 and Biochemistry 220

(Botany 212 may be substituted for Biochemistry 220)

Mathematics: One year of calculus, usually fulfilled by completing Mathematics 113 or Mathematics 124

Physics 141-142

Zoology 240

Foreign Language: German, Russian,

or French, in that order, are preferred

Botany 100 or 101 or 103, 211 (physiology), 303-304 (morphology) and an additional 12 credits of junior-senior courses in Botany from at least two of the following areas:

Ecology (221, 222, 226)

Anatomy and Morphogenesis (291, 301)

Cytology and Cytogenetics (311, 270)

Physiology (212, 215)

Systematics (281, 255)

Students are strongly encouraged to take a course in Microbiology (preferably Microbiology 250) and may substitute such a course for one advanced course in Botany. Students who have had no high school Zoology or who believe their background to be inadequate, should take Zoology 101. Knowledge of a foreign language is strongly recommended and German, Russian, or French, in that order, are preferred.

Students planning to teach in secondary school must take:

Chemistry: 111-112, 160, Biochemistry 220 (Botany 212 may be substituted for Biochemistry 220)

Mathematics: 111-113 or 123-124

Physics: 141-142

Zoology: 135, 240

Botany: 100 or 101, 125, 126, 211 and 11 additional credits in junior-senior courses in Botany from at least two of the areas (ecology, physiology, etc.) listed above.

Students planning to teach are strongly encouraged to take a course in Microbiology (preferably Microbiology 250) and may substitute such a course for one advanced course in Botany.

Additional requirements for certification are Psychology 303 and Education 251 in the junior year, and Education 285, 310 and 311 which are required in one semester of the senior year.

CHEMISTRY

The prime purpose of the Department of Chemistry is to offer sound preparation for graduate study in chemistry. Accordingly, emphasis is placed upon intellectual accomplishment and broad understanding rather than on terminal training for specific chemical tasks. The program also affords sound preparation for work in chemical industry, chemical institutes, or governmental laboratories. A slightly modified program per-

mits preparation for secondary school teaching. Professor G. Richason is the departmental Chief Adviser.

Students planning to major in chemistry should take Chemistry 113, 114; German 110, 120 (recommended, but Russian may be substituted); and Mathematics 123, 124 in the freshman year. It is recommended that the student elect one or more courses in biological science such as Botany 100, Zoology 101, Microbiology 140, 150, 250 or Entomology 126.

The sophomore year should include Chemistry 165, 166, 167, 168; Mathematics 173, 174; Physics 141, 142 (Physics 161, 162, 163 provides a stronger background—if this sequence is selected it should be started during the freshman year); German 130, 148. The junior chemistry major takes Chemistry 210 and 285 during the first semester; and 269, 286, and 287, second semester. Chemistry 288 is to be taken during the first semester of the senior year.

To complete requirements for the B.S. degree with a major in chemistry and to qualify for certification to the American Chemical Society the student must take Chemistry 213 and 246, and two additional courses selected from the listing below. One of these two additional courses must be selected from either the "Physical Group" or the "Organic and Biochemistry Group," and with one of the courses being a laboratory course.

Physical Group: 290, 388, Honors (and certain advanced physics and mathematics courses by approval of the Head of Department).

Inorganic, Analytical, and Radiochemistry Group: 213, 215, 244, 246, 388, Honors.

Organic and Biochemistry Group: 271, 272, 388, Honors; Biochemistry 223, 224.

Students in secondary education may use the Education Block to substitute for the two additional courses.

A student may qualify for the B.S. degree in chemistry (but not for certification to the American Chemical Society) without completing Chemistry 269, 213, or 246. However, the curriculum must then include four courses selected from the above listing. One of these must be a laboratory course, and two different groups must be represented by the selection. Students in secondary education may use the Education Block to substitute for two of the courses in the above groups.

Students may satisfy requirements for the B.A. degree by completing the following: Chemistry 113, 114; 165, 166, 167, 168; 210; 281, 282; and 2 courses from the above listing, one of which must be a laboratory course. The same supporting courses are required as listed for the B.S. curriculum, except that German or Russian is not required, nor is the second year of calculus.

CLASSICS

(See *French, Italian, Classics*)

COMPARATIVE LITERATURE

Present Course Offerings: Courses at the 200 level are offered for purposes of general education; readings are done in English translation. Courses at 300 level and above require an easy reading knowledge of either French or German, unless other languages are specified in the course description. A combination of *either* 203 or 204, plus *either* 201 or 202, can serve to fulfill the humanities core requirement in the College of Arts and Sciences.

The major in Comparative Literature involves the study of literature in two modern languages, a major and a minor, one of which may be English. Students majoring in Comparative Literature must also fulfill a requirement in a third language, modern or ancient, either by taking six hours of elementary course work in that language or by passing the relevant departmental reading examination.

The normal program will consist of 39 hours of course work, not including the work done in the third language. Of those 39 hours, 18 should be elected in the literature of the major language, 12 in the literature of the minor language, and nine from offerings in Comparative Literature. Any student capable of upper-level work in a third language may elect the following distribution: 15 in the major literature, nine in one minor literature, six in another, and nine in Comparative Literature. Courses in language departments taught in translation, and courses in the Comparative Literature sophomore tracks (201, 202, 203, 204) do not count toward the major. It is, however, recommended that prospective majors in Comparative Literature elect courses in the Comparative Literature sophomore track. It is also recommended that Comparative Literature majors take at least three hours in a non-Western humanities course. No courses in the major block may be counted on a pass-fail basis.

W. E. B. Du BOIS

DEPARTMENT OF AFRO-AMERICAN STUDIES

The first responsibility of the department will be to prepare and offer a major in Afro-American studies which will be interdisciplinary in scope. The department will have the parallel responsibility of leavening and affecting the quality and focus of the educational experience of all Black students regardless of their major field of study, thus it will be responsible for the designing of courses and sequences of courses which will be of general interest and of specific relevance to students in disciplines other than Afro-American studies.

The major in Afro-American studies will be recommended only to students intent on a career in teaching or advanced scholarship in Afro-American studies or in one of the relevant professional disciplines. The maximum of 60 required major credits will be spread over many disciplines with a heavy emphasis on History, Sociology, Political Science and Literature. This means that within the scope of the major there will be included courses which correspond to and will fulfill requirements presently offered in existing departments. The student will be required to take at least 24 credits within one discipline, and the rest a minimum of 24 within the other disciplines of the department. The major will be designed to give the student a specialist's training in one area of the Black experience reinforced by a general and theoretical knowledge of other relevant areas of scholarship.

ENGLISH

The student who majors in English will gain a considerable knowledge of Western literature; he will develop skill in expository and creative writing; and he will increase his capacity to read literary works with perception and to judge them by critical standards. Such a program has maximum value as liberal education, and is especially useful to students whose interests are in writing, editing, criticism, and teaching. Assistant Professor Jonathan R. Quick is departmental Chief Adviser; Associate Professor Paul S. Sanders is Director of Undergraduate Studies.

The Department of English offers courses in composition, literature, and language. The Program in Journalistic Studies is also administered by the Department. Students majoring in English must take 1) one period course in English literature be-

fore 1800, 2) one semester of study in a non-English literature, read either in the original language or in English translation, and 3) three of the following four options: a) one course that has as its primary concern the study of the English language, b) one course in the works of Shakespeare, c) one course that studies intensively a single major British or American author, d) one course in the development of a literary genre such as tragedy, comedy, satire, lyric poetry, the novel. The student should elect his remaining six English courses and appropriate courses in other departments, including University core requirements and electives, to provide himself a coherent unit of study that accords with his own needs and interests. He is invited to consult with appropriate members of the Department about such areas of coherence as medieval studies, Renaissance studies, the Enlightenment, art and literature, psychology and literature.

An English major must take at least 30 and no more than 45 hours of upperclass English courses except to the extent that he earns credits beyond the 120 hours required for graduation. Honors theses may be included in or excluded from the 30-hour total at the writer's discretion. A quality-point average of 2.0 or better must be maintained in the upperclass courses listed in the preceding paragraph. The student may count in the 30 hours required for the major up to six credits for any upperclass course in Comparative Literature, or in any foreign literature read in the language or in translation, except for a course elected to fulfill the sophomore literature requirement; any upper-level course in Journalistic Studies or in Linguistics; and any upper-level course in Speech primarily concerned with language or literature. Furthermore, upon presentation to the Chief English Adviser of sufficient justification, the student may obtain permission to count other courses not here included.

A student who intends to apply for admission to the Education Block in preparation for secondary-school teaching should consult with Assistant Professor Meredith B. Raymond, Chairman of the English Department's Committee on Teaching. Especially recommended are English 201, a course in the English language, a course in Shakespeare, courses in American and modern literature, and an advanced course in writing.

UNIVERSITY OF MASSACHUSETTS

FRENCH, ITALIAN, CLASSICS

All language programs are intended to give 1) a thorough training in language skill, 2) an appreciation of the aesthetic and intellectual qualities of the literature, and 3) a serious insight into the cultures of the nations concerned. Majors are required to complete 30 approved junior-senior credits, six of which may be in related disciplines approved by the department. Majors must be guided by the departmental documents describing requirements for undergraduate major in consultation with departmental advisers.

GEOGRAPHY

Geography represents a small but rapidly growing profession in which opportunities in recent years have expanded beyond the traditional employment in teaching at all levels to include work in government, planning and business. The major in geography is intended to provide a sound introduction to the basic branches of the field which will fit a student for graduate work whatever his ultimate career intentions.

All majors are required to take one of the introductory courses (Geography 135 or 155), cartography (Geography 250), two regional courses (Geography 200-249), two systematic courses (260-384) and three other upper division courses. This represents a minimal major sufficiently flexible to permit a student to pursue individual regional or systematic interests. Students are encouraged to consult with the geography faculty so as to design an individual program in which their geographic interests are reinforced with selected work in cognate fields.

GEOLOGY

For students considering geology as a career, the opportunities are many. Those interested primarily in basic science may look to positions in teaching, in museum work, on state and Federal surveys, and in various research organizations. Those concerned with applied science may work in mining geology, petroleum geology, engineering geology, environmental geology, ground water geology, and economic mineralogy. The fields of space science and oceanography also provide opportunities for students with geological training.

The Bachelor of Arts degree program in geology is intended for those wishing a broader education in liberal arts than is possible with the Bachelor of Science degree. The Bachelor of Arts degree is also

adequate preparation for graduate work in geology.

The Bachelor of Science degree program is divided into two options, a Geology Option and an Earth Science Option. The Geology Option is designed for those planning a professional career in geology, and provides preparation for graduate work. The Earth Science Option prepares students specifically for careers and certification in the teaching of an earth science course in the secondary level. The departmental Chief Adviser is Mr. T. Rice.

Bachelor of Arts degree in geology requirements are: one year in each chemistry and physics; Mathematics 123; and 30 credits in geology, including one of the introductory courses in the 100 series (exclusive of 192), 192, 220, 230, 231, 240, 250, and 251. A summer field course is strongly recommended. Students interested in combining geologic and engineering training may consult the Head of the Department for special provisions relating to their programs.

Bachelor of Science, Geology Option, requirements are: one year each of chemistry and physics; Mathematics 123 and 124, and one additional 3 credit course in mathematics or statistics; 33 credits in geology to consist of one of the introductory courses in the 100 series (exclusive of 192), 192, 220, 230, 231, 240, 250, 251, and an approved summer field course or summer work; and at least twelve additional credits in mathematics, engineering, geology or other sciences elected in consultation with an adviser. Not less than three nor more than nine of these twelve additional credits should be in geology courses numbered 200 and above. German, French, or Russian are the recommended foreign languages.

Bachelor of Science, Earth Science Option, requirements are: one year each of chemistry and physics or astronomy; Mathematics 123 and 124; 22 credits in geology including one of the introductory courses in the 100 series (exclusive of 192), 192, 220, 230, 240, 250, and 251; at least 12 additional credits in mathematics, geography, or other sciences, elected in consultation with a geology adviser; and the Secondary Education Block.

GERMANIC LANGUAGES AND LITERATURES

The elementary and intermediate courses in German are intended to serve as a foundation for a practical knowledge of the language aiming toward wide reading in liter-

ature, toward mature oral and written communication and as an aid to research in various other disciplines. The German major examines the full range of German literature and culture as well as the history of the German language and its development within the framework of the Indo-European languages. Mr. H. A. Lea is the departmental adviser.

To fulfill an undergraduate major in German, a student must complete 39 credits in the department's junior-senior courses. Two programs are available: one is designed principally for those who wish to teach in elementary or secondary school (Program A), the other for those who are primarily interested in continuing their studies in graduate school (Program B).

Students selecting Program A should take 161, 259, 264, 270, 277, 278, 279, 280, and 281, and a minimum of three courses in German literature, one of which must be in the twentieth century (253 or 254).

Students selecting Program B should take 161, 259, 263, 277, 279, 280, and 281, and one course in each of the following categories: (a) 251 or 252; (b) 253 or 254; (c) 255 or 256 or 257; and (d) 258 or 260 or 261.

One course in history or philosophy is required of all German majors.

Freshmen who fulfill the language proficiency requirement upon entrance should take 161 or 279.

Students are urged to supplement their course work with at least one summer session at an approved summer school of German or by participating in a summer program abroad, such as the University offers in Freiburg, Germany.

GOVERNMENT

Courses in government are designed to aid the student in gaining a knowledge of the nature, functions, and problems of political systems, and of the place of politics in the modern world. These courses can be broadly grouped into the fields of political theory, public law, international relations, both American and foreign governments and politics, and public administration.

Students taking work in government may prepare themselves for a wide range of careers, such as graduate study in political science leading to academic or research careers, careers in public service at the Federal, state or local level, political careers, the study and practice of law, the Foreign Service or international organizations, and

secondary school teaching. Prof. G. Sulzner is the departmental Chief Adviser.

The Government Department offers two introductory sequences, Government 100-150 and Government 160-161. Government 100 or Government 160 meets the University requirement of an introductory course in social science. Either Government 150 or Government 161 fulfills the social science distribution requirements. Credit will not be awarded for more than 6 credits of introductory work; students should therefore take either the Government 100-150 sequence or the Government 160-161 sequence.

Majors in government begin with Government 100-150 or Government 160-161, preferably in their freshman or sophomore years. A minimum of eight additional government courses is required. In addition, the department requires supporting work in history and philosophy along with some in economics, psychology, or sociology.

HISPANIC LANGUAGES AND LITERATURES

The department offers a major in Spanish and a number of courses in Portuguese. A major in Portuguese is planned.

All the department's programs stress training in and the use of language skills. The courses in Hispanic literature are taught for their basic literary values and for the insights these afford into the culture of Spanish- and Portuguese-speaking peoples. The department also offers courses which directly stress the use of the Spanish language and which are of particular advantage to those Spanish majors who plan to teach the language.

Beginning with the academic year 1971-72, majors will be required to complete 36 junior-senior credits, 12 of which may be in related areas and disciplines approved by the department. Entering Spanish majors who achieve an intermediate year level in the placement tests are urged to take Spanish 146, an intensive course which will permit them to start their Spanish concentration one semester sooner than if they were to take Spanish 130-140, the usual intermediate course.

Prerequisite to a major in Spanish are the following courses: Spanish 131-141, 161-162, 181-182, 190.

The successful completion of courses from the following areas will constitute partial fulfillment (24 credits) of a major in Spanish:

- (a) Three courses in Conversational

Spanish: Spanish 251, 252, 253 (one credit each).

- (b) One course from the Medieval Literature group: Spanish 315, 317, 318.
- (c) Two courses from the Renaissance and Golden Age Literature group: Spanish 325, 330, 335, 340.
- (d) One course from the Eighteenth and Nineteenth-Century Literature group: Spanish 355, 365.
- (e) One course from the Twentieth-Century Peninsular Literature group: Spanish 381, 382, 383, 384.
- (f) Two courses from the Spanish-American Literature group: Spanish 370, 371, 372, 373, 374, 375.

HISTORY

Courses in history are designed to provide an understanding of man through a study of patterns of development in the past. The study should also give the student an introduction to major problems in world affairs. A major in history has value to the general student as a humanistic discipline. It has application as preparation for careers in such fields as teaching, law, government, journalism, ministry, library science and business.

History majors must take as required courses in their freshman and sophomore years two year-long sequences chosen from History 100-101 or 110-111, 115-116, 120-121, 150-151. The history major will select one of four areas of specialization (European, British, American or Latin American history) and take within it a minimum of 18 credits of upper-level course work. Students specializing in European history will be required to include in their program at least 3 credits in ancient or medieval history and an additional 3 credits in the early modern period (from the Renaissance through the 18th century). In addition a student will take three electives outside his specialization for a total of 27 upper division credits.

ITALIAN

(See *French, Italian, Classics*)

JOURNALISM AND JOURNALISTIC STUDIES

Two basic programs are provided. One, a major in Journalistic Studies, consists of liberal arts courses that introduce students to scholarly research about journalism. The other, designated as Journalism, is a co-curricular program of work on newspapers

under tutorial guidance from persons who have had experience in hiring and training reporters and who can, hence, provide counseling and placement services to students (and editors) based on how students have performed in a realistic test of journalism aptitude.

JOURNALISM

This co-curricular (non-credit) tutorial program is open to all students, regardless of their majors, who think they are interested in journalism careers. It is designed to be a superior substitute for vocationally specialized courses, often called professional courses, such as News Writing and Copy Editing. Since it was established, in 1946, all students who wanted a journalism job have been placed and have proved successful on the job in the opinion of the editors to whom they had been recommended. The reason for its success is that it permits students to make informed career choices. It also provides students with published articles in newspapers that, along with the newspaper experience, are useful as job-getting credentials.

Newspapers in Northampton, Greenfield, Holyoke, and Springfield cooperate in this co-curricular or journalism program. The college daily also cooperates, and any student who writes for it may obtain tutoring in journalistic writing techniques. Undergraduates interested in journalism careers should spend a few hours weekly writing for the college daily, starting in their sophomore year, and should seek work on a commercial newspaper during the summer of their junior year. Summer placement aid is provided as part of the tutorial and counseling program.

As a rule, the director of the journalism program arranges for students to participate in the tutorial program with commercial newspapers after they have participated in the tutorial program with the college daily.

JOURNALISTIC STUDIES

This liberal arts curriculum program introduces students to journalism as an academic discipline (communications research). Majors in Journalistic Studies must choose either an *interdepartmental major* in which the student earns at least 15 junior-senior credits in Journalistic Studies along with 15 junior-senior credits in one other liberal arts department, or a *double major* in which the student earns 15 credits in Journalistic Studies while also completing all the re-

quirements for a major in one other liberal arts department, such as English, Government, or History. A student's choice of an interdepartmental or a double major is made by agreement with his or her adviser. The interdepartmental major is generally limited to honor students who must apply to the Chairman of Journalistic Studies.

All writing courses are taught by the Department of English, and any two of its eight advanced writing courses are acceptable in meeting the major requirement of at least 15 credit hours in Journalistic Studies. Because the writing process is the same regardless of the product, no particular writing courses are recommended. No more than one writing course should be elected in any one semester. All majors must elect at least three of the following eight content courses in Journalistic Studies:

- Introduction to Mass Communication
- Language and Communication
- Independent Study and Research (I and II)

- The Communication Process (Summer Course)

- Mass Communication Theory
- International Communication
- Freedom of the Press Seminar

The Journalistic Studies courses provide background for students interested in such diverse career objectives as communications research, law, advertising, editorial work for newspapers or magazines or publishing houses or radio and TV stations, public relations, teaching, and creative writing. Graduate study is required for careers in communications research.

Students interested in the Journalistic Studies program should see Dr. Barney Emmart. Students interested in the Journalism program should see Dr. Arthur Musgrave.

MATHEMATICS

(See also *Statistics*)

The student electing mathematics as a major will find programs providing a variety of stimulating options. These include preparation for a career in teaching at secondary school level, graduate and research work in mathematics, computer programming and data processing, actuarial work, statistics, or an industrial position. Both Bachelor of Arts and Bachelor of Science degrees are offered, and the choice is generally based upon the interest of the student and the direction he wishes to take.

Within the diversity of course offerings lies a core of eight courses (Mathematics

123, 124, 173, 174, 200, 211, 212, 325) which the faculty feel are vital for the understanding, appreciation and intelligent use of modern mathematics. These eight courses, required of all math majors, are designed to introduce the student to two of the major areas of mathematics—analysis and algebra. Included in analysis are calculus and an introduction to topology, while algebra includes vector spaces and matrix theory.

In addition to these core courses, the student will elect four upper division mathematics courses (numbered above 200) related to his personal goals. If interested in computer programming and data processing, he would probably take courses in logic, computer science, and linear programming, and perhaps one in probability or statistics. The student bound for a teaching position in a secondary school would probably elect a course in informal geometry, a course in higher geometry or set theory and then spend an entire semester in his senior year practice teaching in a public secondary school. One wishing to enter the actuarial field or industrial employment would undoubtedly want to take courses in probability and statistics, an additional course in analysis (differential equations and numerical analysis), and possibly a survey course of advanced mathematics for engineers (or an applied complex variable course), along with one or two specific engineering courses.

The math major primarily interested in statistics will find that the mathematical base provided in the eight core courses is precisely what is recommended by the leading statistical societies. The introductory courses in statistics and probability will then qualify him for a starting position in industry, or for graduate work.

The student planning to enter the collegiate teaching profession or do research in mathematics would be thinking of graduate school and would be urged to take a greater concentration of the so called "pure" math courses such as group theory, number theory, differential geometry and set theory.

Those students who have demonstrated unusual mathematical aptitude by the completion of their junior year are encouraged either to enroll in a graduate course or to participate in the Senior Honors Program.

The student majoring in mathematics is assigned a faculty adviser. Further opportunities to meet with faculty members on an informal basis are provided by the Mathematics Club, which also invites guest

lecturers to speak on topics of current interest to math majors. For those who enjoy competitive mathematics the department has for the past several years entered a team in the national Putnam Prize competition. Professor S. Allen is departmental Chief Adviser.

MICROBIOLOGY

The major program in microbiology is designed to offer students sound preparation for more intensive graduate study and research in microbiology, as well as basic preparation for a wide variety of positions as microbiologists in research and non-research laboratories. In either event, microbiology majors should immediately begin preparation in chemistry. Microbiology majors are required to have broad training in collateral sciences, and minimum requirements include chemistry through quantitative analysis and organic, and one year each of introductory biological science, physics, and mathematics. Those students contemplating graduate study will be advised to emphasize stronger training in these collateral sciences. Courses in microbiology are designed to offer fundamental training in the basic core areas and disciplines of this field. Microbiology 250, 280, 340, and seminar are required of majors. Prof. R. P. Mortlock is departmental Chief Adviser.

MUSIC

The Music Department offers the Bachelor of Music degree and the Bachelor of Arts degree. A student must apply to the department for admission. An audition is required of all applicants.

The Bachelor of Music degree may be earned with one of three areas of concentration: performance, theory-composition, or music education. The three programs have a considerable part (91 credits) in common: The University core requirements (33 credits—36 when Music 111 is counted as the "C" course), a series of background courses in Music (58 credits) consisting of theory courses 111, 112, 113, 114, 211, 212, 215, and 216 (23 credits), music history and literature courses 102, 201 and 202 (9 credits), performance courses each semester (24 credits), and course 363, Conducting, (2 credits).

The additional requirements for a concentration in performance are: music courses 217, 385, 386, eighteen credits in performance, and 12 elective credits, six of which

may not be music credits (totalling 129 credits). A senior solo recital is required.

The additional requirements for a concentration in music education depend upon whether the student's primary skill is vocal or instrumental. In either case, 5 additional credits in performance work and 15 credits for the teacher certification courses are required. For voice students, 16 credits in music education, 6 credits in Italian, and 6 elective credits (totalling 139 credits) are required. For instrumental students 7 credits in music education, 18 credits in instrumental techniques, and 3 elective credits (totalling 139 credits) are required.

The Bachelor of Arts program for a music major is pre-professional, serving the needs of the student who wishes to broaden his cultural background. All majors will take 111, 112, 113, 114, 201, 202, 211, 212, and must register for applied music and either band, orchestra, or chorus every semester. The student will choose as his area of concentration music history, theory, or applied music. The junior-senior years will include a sequence of advanced courses suggested by the department. Students whose major area is applied music are required to present a senior solo recital. Prof. J. Contino is the departmental Chief Adviser.

Majors in other departments may elect a minor in music. This program should include 111, 112, 201, 202, and 4 credits in ensemble or individual applied music. Education majors, upon completion of 111-112, should elect 242 in lieu of 201.

The band, orchestra, chorus, and various small ensemble groups are open to all University students who wish to participate in a performing organization.

The Music Department is an associate member of the National Association of Schools of Music.

PHILOSOPHY

Philosophy seeks a comprehensive understanding of the various areas of man's experience in their interrelatedness. In the context of historically important theories, the courses concentrate on methods of inquiry into the persisting questions of philosophy, standards of thought, clarification of ethical and aesthetic values, and the basis of criticism.

Students majoring in philosophy will complete a minimum of 30 credits in courses offered by the department, exclusive of honors work. Normally there should be included 105, 110, 125, 201-204, and at least

one course from 295, 385, 386, 390, 391. Prof. J. Robison is the departmental Chief Adviser.

Beginning with the class of 1968 and subject to waiver in special cases, each major is required to include in his program: a course in logic; a course in ethics; four of 201, 202, 203, 204, 261, 264; and the senior seminar.

Philosophy is closely related to many other academic disciplines; it is therefore advisable for every student majoring in this field to carry his study of one other area to a depth sufficient for the exploration of its relations with philosophy. When desirable for this purpose, the minimum of 30 credits in philosophy may be reduced, with departmental approval, to 24. Within the limits of the desirable concentration suggested above, a wide range of supplementary courses is advised among which the following are suggested as typical: Anthropology 104; Art (historical courses); Education 251; English 205, 282; German 256, 257; Government 303, 201, 202; History of Science 360; Mathematics 211, 212; Music (historical courses); Psychology 235, 281; Sociology 282; Speech (historical courses).

For an introduction to the field as a whole, it is advised that a course be selected from 105, 110, 161 and/or 162; but students planning to take advanced work will do well to select from 105, 110, 201-204.

PHYSICS

(See also *Astronomy*)

Advances in fundamental physics and consequent technological developments in this century have had a great impact on modern society. Study of the basic principles of physics is highly recommended as an essential part of a liberal education. Many introductory courses are offered by the Department of Physics and Astronomy: Physics 116, 117, and 118 are primarily of cultural value; Physics 121-122 and Physics 141-142 cater to the needs of non-physics majors in general. Students planning on going to medical school elect Physics 141-142. None of the above courses is normally available for major credit in Physics. Physics 100 is appropriate for students who want to be exposed to some of the highlights of Physics in one semester. This course offers an excellent opportunity for a student to test his interest in Physics as a possible major area. Physics 161-162-163 provide the necessary Physics background for Engineering, Chemistry and other Physical Science majors.

Students planning to major in Physics may consider one of two kinds of programs. The R program is aimed at those who wish to pursue research and university careers and plan to go on to graduate study in Physics. The T program is designed for those who plan to go into inter-disciplinary work, physics teaching at the high school level or science-oriented, administrative, technical, and business careers. Considerable flexibility is available in this latter program to suit the needs and goals of the individual. Although it is possible to switch between the two programs until fairly late stages, students are strongly urged to plan their courses early in consultation with faculty advisers in the Department. Dr. Claude M. Penchina is the Chief Adviser. Either the series Physics 181-182-183-184 or Physics 161-162-163 is appropriate for Physics Majors in the Freshman and Sophomore years although Physics 181-184 is the preferred start for students interested in the R program. This series is also available for non-physics majors who may wish to learn Physics with a more substantial degree of mathematical sophistication. Minimum mathematics courses are Mathematics 123-124-173-174 (or equivalent background). These should be started at the beginning of the Freshman year if possible. The Freshman and Sophomore years should include two science elective courses (such as Chemistry 111, 112).

In addition to the above, the following are minimum requirements for a B.A. or B.S. degree in Physics: 18 credits in upper division courses in the Department of Physics and Astronomy, which must include at least 4 credits in electricity and magnetism with a laboratory, 3 credits in modern physics and 3 credits in advanced experimental work or an experimental honors project. Normal preparation for graduate study in Physics (R program) consists of several Physics and Mathematics courses in addition to the minimum requirements (see the following typical program). The distinction between the B.S. and B.A. degrees is made on the basis of distribution requirements set by the College of Arts and Sciences.

Typical programs for both types of majors are:

R Program

Freshman year	
Phys 181	Phys 182
Math 123	Math 124
Science elective	Science elective

Sophomore year	
Phys 183	Phys 184
Math 173	Math 174
Junior year	
Phys 251, 255	Phys 252, 256
Phys 387	or Phys 319
Senior year	
Phys 271, 285	Phys 272, 286
Phys 385	or Honors project

T Program

Freshman year	
Phys 100	Phys 161
Math 123	Math 124
Science elective	Science elective
Sophomore year	
Phys 162	Phys 163
Math 173	Math 174
Junior year	
Phys 200	Phys 301, 385, 390
Senior year	
Phys 302, 386, 390	Education block or other electives

PSYCHOLOGY

The courses in the Psychology Department are planned to impart an understanding of the basic principles, methods and data of psychology as a science and the application of this knowledge to current issues. The Department recognizes that interest in psychology is not limited to those who intend to pursue careers in the discipline. Course offerings are therefore designed so as to permit students to pursue study of various aspects of the subject to differing levels of depth. The wide range of the discipline further permits students to pursue programs of study which lead to either the B.A. or the B.S. degree, depending on the pattern of courses the student elects in the Department and the College.

Psychology 101 is the prerequisite entrance course for all students. Both psychology majors and non-majors may then elect any of the following additional courses without further prerequisite: 141, 145, 201, 210, 220, 230, 260, 262, 263, 270, 280, 290, 301, 305, 311, 325.

Students interested in majoring in psychology should elect Psychology 141 following completion of Psychology 101 and may then pursue a general psychology major or one designed for those preparing for graduate study and professional careers in the field. The general psychology major provides opportunities either for those seeking a general education or for those entering career fields for which psychological information is relevant to pursue a major in psychology

without the emphasis on laboratory methodology that would normally be part of the program of those seeking admission to graduate study in the field.

The *general psychology major* must elect, in addition to Psychology 101 and 141, the following: Psychology 305 and a minimum of 21 (and no more than 27) credits of advanced level courses in the Department. Included in the elections must be at least two courses from each of the following two groupings: A: 210, 220, 230, and 250; and B: 260, 270, and 280. Students entering the major will be assigned a Departmental Faculty Adviser with whom discussions should be held from time to time regarding course selection and choice of electives. This program allows the student considerable flexibility to elect a variety of courses both within and outside the Department suited to his interests and needs. Students completing this major will fulfill the *Departmental requirements* for the Bachelor of Arts degree.

(NOTE: Students who have entered the B.A. program may elect the additional courses indicated below to complete a "career" major *without* shifting to a B.S. program or they may elect to become B.S. degree candidates if in the balance of their program they choose and are able to meet the *additional science requirements of the College*. Depending on their backgrounds, certain transfer students may have difficulty fulfilling these requirements in the time they have available. Students who are in doubt as to which major or degree programs to follow should discuss the available options with their Faculty Advisers.)

The *career psychology major* must elect the same program as the general psychology major as a minimum. In addition, such students should plan to elect Psychology 145 and at least one laboratory course from each of the following two groupings: A: 211, 221, 222, 231, and 251; and B: 261, 271, 281, and 282. These laboratory electives must be taken in proper sequence with their associated non-laboratory prerequisites or co-requisites. Students completing this major will fulfill the *Departmental requirements* for either the Bachelor of Arts or the Bachelor of Science degree.

Students in the "career" program (either B.A. or B.S.) who are otherwise

eligible will be encouraged to participate in the Honors Program in their junior and senior years.

Selected majors in either program may from time to time be invited to participate in Special Problem programs, the Department's cooperative teaching program or both.

General vs. career major. Both majors permit a considerable degree of flexibility to students in electing courses to meet their individual needs. Graduates from either program (and with either B.A. or B.S. degrees) may pursue advanced study in psychology or related fields. The designation of one program as a "career" major is for the purpose of informing students of the *typical preference* of graduate psychology departments at the present time for applicants who have some background in quantitative and laboratory methods.

Students in the career major program would be assumed to have already made commitments to pursue graduate study, though of course they need not follow this implied intention. Those who for any reason choose to pursue the general program rather than the more intensive career program need not feel that they have excluded themselves from further study or careers in the field.

Only in respect of admission to courses with limited enrollments and to restricted honors and other special offerings will preference be given to those students electing the career major. Otherwise, students in both majors (and in both B.A. and B.S. degree programs) will have full access to the facilities of the Department.

Prof. H. Schumer is Chief Adviser for the Department and director of its undergraduate programs. Students are assigned to individual Faculty Advisers when they elect to major in the Department.

SLAVIC LANGUAGES AND LITERATURES

Students choosing Russian as their field of major concentration will receive training designed to provide them with proficiency in reading, writing, speaking and understanding the language, as well as with a knowledge of Russian literature. Russian majors will also be encouraged to acquire a background of the history, government, economy and sociology of Russia—a background necessary for an understanding of the culture and literature of the Russian people. Russian majors will be prepared to

continue their education at the graduate level in the fields of Russian, Slavic languages and literatures, or Russian area studies. Those who choose to become teachers or translators will have the necessary preparation and background in the structure of the language and in teaching methodology, or experience in translating scientific, technical and scholarly prose.

Prerequisite for a major in Russian is the successful completion of four semester courses in the language (12 credits): Russian 110, 120, 130, 140 or the equivalent.

Departmental requirements for a major are the successful completion of

- (a) Six semester courses of language study at the junior-senior level (18 credits): Russian 261, 262, 271, 272, 281, 282.
- (b) Two semester courses of literature study at the junior-senior level (6 credits): Russian 251, 252.
- (c) At least two additional courses in Russian culture, language or literature, to be selected from the following: Russian 201, 253, 254, 255, 256, 257, 258, 264, 265, 266, 310, 320, 331, 385 or 386.
- (d) Two semester courses in Russian History: History 214, 215.

A list of University courses related to a Russian major may be found at the end of the Russian course offerings. The department strongly recommends that all Russian majors take as many of these related courses as possible, in order to enlarge and deepen their general background.

Professor Maurice I. Levin is Chief Adviser.

SOCIOLOGY

The courses in sociology are planned to give the student an understanding of the factors which influence man in his activities and interests as a member of society and to introduce the fundamental methods of research in sociology. The course offerings are designed so that students who desire to prepare for graduate work, as well as those who do not, will find suitable programs for study available within the department.

Career opportunities are open in a wide range of fields which include public and private welfare agencies, governmental and private research organizations, and education. Those interested in research careers should incorporate within their programs courses in statistics and methodology beyond the introductory levels and should plan on

graduate training if they aspire to full professional status in the discipline. The American Association of Schools of Social Work indicates that the pre-professional subjects most closely related to professional work in that field are economics, political science, psychology and sociology.

All majors are required to take Sociology 101 (Introductory Sociology), and a minimum of eight to a maximum of ten 200-level courses selected from among courses offered by the Sociology Department. Sociology majors, especially those who are considering graduate studies, are strongly advised to take a statistics course, Sociology 282 (Sociological Theory), and Sociology 295 (Research Methods). Sociology majors must take four courses from the "E" group in the catalog from at least two of the groups, (a) Biological Science, (b) Physical Science, (c) Mathematics, and are required to select two courses of three credits each from Economics, Government, Geography, Psychology, and Anthropology. Mr. William D. Bathurst is Information Officer for Sociology majors.

STATISTICS

The curriculum in statistics is designed to teach the student to observe carefully and correctly, to treat data honestly and dispassionately and to reason objectively from a set of conditions to their logical conclusions. It emphasizes the logical relation of the analytical techniques taught to the main categories of scientific method: observation and classification of data, induction and deduction.

The statistics curriculum introduces students to the analytical techniques commonly used in the social, biological, and physical sciences, business, engineering, and other disciplines which share the problem of how to study large quantities of data. Students with training in calculus should elect Statistics 315 and 316. Students without calculus who desire a thorough grounding in the concepts underlying statistics should elect Statistics 231 and 232. Students who wish to obtain some familiarity with elementary statistical ideas and techniques should elect Statistics 121 and subsequently Statistics 251.

Any of the three courses Statistics 121, 231, or 315 serve as prerequisites for sampling theory (S271), design of experiments (S261, S262), and multivariate analysis (S281, S282).

There is no undergraduate major in

statistics. Those who intend to study statistics at a graduate level should concentrate on mathematics and elect courses in computer science. According to his interest, useful background can be obtained in fields such as animal and plant breeding, econometrics, engineering, market research, sociology, and psychology. Advanced courses in statistics require a background of at least two years of calculus and preferably Mathematics 325 (Intermediate Analysis) and Mathematics 511, 512 (Abstract Algebra).

The Statistical Laboratory located in Arnold House is open to students and staff wishing to use its facilities. Students wishing to use the calculating machines will be instructed in their proper use. The Laboratory is supervised at all times. Professor S. Allen is Chief Adviser.

SPEECH

Courses in speech are designed to enrich the student's understanding of man through theoretical study of the speech communication process and the application of this theory to various speech forms. A major in speech is valuable, not only to students preparing for a career in one of the speech disciplines, but also as preparation for careers in law, government, the arts, and business.

Majors are required to select one of the following areas of concentration: 1) Communication Disorders (Speech Pathology and Audiology), which is recommended for students who plan to prepare themselves for graduate study in order to meet American Speech and Hearing Association (ASHA) certification standards for careers as speech therapists; 2) Mass Communications (Film-Radio-Television), which is recommended for students who plan to pursue careers in educational or commercial broadcasting or to prepare themselves for graduate study in mass communications; 3) Rhetoric and Public Address, which is recommended for students who plan to pursue careers in law, the ministry, public relations, and similar professions or to prepare themselves for graduate study in rhetoric; 4) Theatre and Oral Interpretation, which is recommended for students who plan to pursue careers in community or commercial theatre or to prepare themselves for graduate study in theatre; 5) Speech Education (a combination of courses from all areas, especially rhetoric and theatre), which is required of all students who plan to earn a secondary school teacher's certificate in speech.

Majors must earn 30 credits of upper-level course work within the department together with prerequisites and related courses in other departments required for an area of concentration. Prof. W. Price is the departmental Chief Adviser.

ZOOLOGY

Beginning with the class of 1972, the curriculum for Zoology majors has been revised extensively. The new curriculum reflects the following opinions of the faculty.

1. Students who major in Zoology should acquire a broad knowledge of biological concepts and principles, reinforced by factual knowledge without which these concepts and principles are professionally meaningless.

2. Within this framework, or core curriculum, a considerable degree of flexibility in selection of courses is both possible and desirable.

3. The core curriculum should be supplemented by a coordinated group of elective courses. These will most often be in Zoology, other biological or physical sciences, mathematics, psychology or anthropology but may be in any other department of the University which best prepares each student for his own professional goals, which takes advantage of his interests, and which also takes into account limitations in his aptitudes.

Each student majoring in Zoology must complete the following Zoology courses: 240 (Principles of Genetics); 360 (General and Cellular Physiology); 221 or 223 or 227 (Comparative Anatomy or Histology or Embryology); 281 or 282 or 283 (Biology of the Lower Invertebrates or Biology of the Higher Invertebrates or General Parasitology); 246 or 335 or 337 or 350 (Population Genetics or Limnology or Population and Community Ecology or Animal Behavior); and 366 or 370 or 380 (Vertebrate Physiology or Comparative Physiology or Developmental Biology). He must attain intermediate proficiency in one of French, German or Russian and complete satisfactorily the following collateral courses: Botany 100 (Introductory Botany); Chemistry 111, 112 (General Chemistry); Chemistry 261, 262, 263, 264 (Organic Chemistry); Biochemistry 223 (General Biochemistry); Mathematics 123, 124 (Analytic Geometry and Calculus); and Physics 141, 142 (Introductory Physics). Students with a special interest in chemistry or chemical biology

may, with the approval of the Chemistry Department, substitute Chemistry 113, 114 for the 111, 112; and those with a special interest in physics may wish to substitute Physics 161, 162, 163 (General Physics) for 141, 142.

All students should enroll in a chemistry sequence in their freshman year, because subsequent courses in Organic Chemistry and Biochemistry are prerequisite to Zoology 360 which in turn is prerequisite to all of the courses in the 366-370-380 group.

Botany 100 should be elected in the fall of the freshman year, as it will serve to review major biological concepts prior to the Zoology major's first Zoology course (genetics) in the spring of his freshman year. The mathematics requirement should also be completed in the freshman year.

Zoology 101 (Introductory Zoology) is not required of Zoology majors. Those who have not studied biology in high school or those who feel that their knowledge of introductory Zoology is inadequate may enroll in the course or audit the lectures prior to or concurrently with their enrollment in Zoology 240.

Students who, by advance placement, receive partial or full credit for English, Foreign Language, or Mathematics may take advantage of the increased flexibility in the freshman year to complete other general College or University graduation requirements, to enroll in courses of interest in other departments, or to begin or complete their Physics requirement in the freshman year.

The curriculum for those who plan to become certified secondary school biology teachers requires, in addition to the departmental requirements outlined above, Botany 125 (The Plant Kingdom) and 126 (New England Flora); Psychology 101 (General Psychology) and 301 (Educational Psychology); Education 251 (History of Education) and, in the senior year, the concentrated "Secondary Education Block" of 12 credits of Education courses. Students in the Secondary Education curriculum may, with the permission of their adviser, substitute Zoology 135 (Introductory Physiology) for the requirement of one of the 366-370-380 group providing that the substitution is not made before the student's junior or senior year, when his plans for secondary teaching have become firm.

A word of caution is necessary. Growth of the department's facilities has not kept pace with the increasing number of students who wish to major in Zoology. It has therefore been necessary for the department to limit the number of majors it can accept. The only fair basis on which such limitation can be made is the student's over-all academic performance during his first three semesters. In April, 1969, it proved impossible for the department to accept as majors those members of the class of '72 who had not achieved at least a 2.0 quality point average at the end of their third semester. The level of achievement required is expected to increase continuously for several years, or until greatly enlarged facilities become available.

School of Business Administration

The faculty of the School of Business Administration is keenly aware of the dynamic changes taking place in our economy, the extensive shifts in occupations and professions and the consequent need for intelligent and well-educated businessmen. The continuing advancement of technology, science, and the behavioral sciences has placed upon Schools of Business Administration the necessity to probe, not only into the developments of its own areas of education, but also into the relationships that exist among other areas such as mathematics, economics, psychology, sociology, and government.

The School of Business Administration prepares students to take advantage of important economic opportunities and eventually to assume positions of responsibility in business. The school's educational program is directed toward the broad aspects of business, encouraging high standards of ethical conduct, broad social responsibilities, and the development of competence in particular courses of study of the student's own interest, aptitude, and choice.

The first two years emphasize general education by providing fundamental courses in the humanities, mathematics, science, and social science. In addition, basic courses in accounting and economics prepare the student for further work in the School of Business Administration. The junior and senior years emphasize a greater degree of specialization and provide for this in the programs indicated below. But even in these last two years all students need to view business as a whole in so far as a "core" of courses can do this. This "core" consists of introductory courses in Finance, Marketing, Management, Business Law and Computer Programming. A total of at least 120 credits is required for graduation. Each course of study leads to a degree of Bachelor of Business Administration.

Students transferring to the School of Business Administration from any school or college within the University shall receive junior and senior elective credit only for those courses passed with a grade of C or better.

Students who intend to transfer from junior or community colleges should complete the program in liberal arts and not register for courses in Business Administration, except Principles of Economics and Elementary Accounting.

Transfer students who complete courses in their first two years that are offered in the junior or senior years will receive transfer credit only if such courses are accepted by the department concerned. An examination for such credit may be required.

The School of Business Administration is a member of the American Association of Collegiate Schools of Business.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Rhetoric 100	3
Mathematics 116	3
†History and/or Government	3
‡Natural Science	3
*Sociology	3
General Physical Education	1

<i>Second Semester</i>	<i>Credits</i>
Rhetoric 110	3
Mathematics 117	3
†History and/or Government	3
*Math 115	3
*Psychology	3
General Physical Education	1

*May be taken either semester.

†Any sequence or combination of History 100, 101, 150, 151 or Government 100, 150, 160, 161.

‡Any course identified by the letter "E" in the catalog.

ACCOUNTING

The accounting program is designed to prepare students for public accounting and for positions in business, industry, and government which require a knowledge of accounting.

GENERAL BUSINESS AND FINANCE

The department offers five programs of study and specially designed programs for those students who wish to combine business administration with a related field of study outside the School of Business Administration. The program in Financial Management is designed for those students who wish to prepare for careers in the area of planning and controlling the financial operations of non-financial firms, financial firms, and governmental units. The program in General Business, emphasizing breadth of knowledge and viewpoint, is designed for those students who are uncertain as to their specific career objectives. The program in Business Administration and Economics recognizes the close relationships between areas of study and permits students to complete 27 credits in economics. The program in Business Administration and Quantitative Methods exposes students to operations research and systems analysis through a detailed treatment of the application of mathematics, statistics, and computer science to problems in all of the functional fields of business administration. Since the mathematics and statistics requirements for this program depart from the normal requirements, it is important that interested students

elect this program early in their studies. Sophomore and transfer students who have not completed the specified quantitative courses may elect this program only with the permission of the program adviser. The program in Urban and Regional Studies combines courses from many disciplines, including economics, sociology, government, civil engineering, landscape architecture, and agricultural economics. The specific content of a special program is mutually determined by the department chairman and the student.

MANAGEMENT

Many management majors upon graduation go directly into responsible positions in business and government. Others enter management development programs or go on to graduate study.

Each of the programs offered by the department is designed to provide a strong general education together with the basic conceptual and technical skills necessary for success and advancement in all types of organizations.

MARKETING

The role of marketing management in our economy is becoming increasingly important. The department of marketing offers a broad range of courses for those students interested in careers in marketing administration, advertising, marketing research, and wholesale and retail enterprise. The department's objective is to provide a specialized and comprehensive understanding of today's managerial marketing problems.

School of Education

The School of Education has and is continuing to undergo significant changes as it attempts to act as a catalyst for change in the educational complex. After an initial period of intensive planning and restructuring, the School is now committed to an ongoing process of developing and implementing alternatives which it is hoped will improve the level of service in education from kindergarten through higher education.

In addition to the varied course/program options that are open to the student, a "Modular Credit Program" is also available which allows the student to supplement the traditional 3-credit course process. As an example of the flexibility and individuality that characterizes the School, Credit Modules are offered for a large variety of learning experiences that are particularly applicable to the individual student, as judged jointly by the student and a Modular Unit Committee.

The School of Education revolves around a number of organizational components called Learning Centers and Programs.

While these components represent specialized learning areas, interaction of ideas and personnel among the Centers and Programs allows for a more complete educational experience to emerge from any degree program.

These 11 Learning Centers and three Programs are: The Centers for Aesthetics in Education, Counselor Education, Educational Research, Humanistic Education, Study of Educational Innovations, International Education, Leadership in Educational Administration, Educational Media and Technology, Foundations of Education, Teacher Education, and Urban Education, and The Programs for Early Childhood Education, Higher Education, and Vocational/Technical Education.

In addition to these areas of specialization, there are numerous, continually changing academic programs in a non-center classification. Examples of current programs in this area include Ecology, Futurology, and Instructional Applications of Computers.

Teacher Education now has merged into a complete Kindergarten through Twelfth Grade approach, with three sepa-

rate alternatives open to students. These routes can be entered at various times during the student's academic career, rather than waiting until the Junior Year. They include: 1) the Modified Education Block which includes orientation, observation, methods courses and supervised teaching; 2) the Intern Program is a program in which the student spends his full 16-week semester in a supervised teaching situation. He may elect to take his methods either before or after his field experiences. These schools have been selected for their unique approaches to education and the valuable experiences they can provide for the student teachers; 3) other experimental programs. Interested students enrolled for teacher certification should contact the Center for Teacher Education as there are a variety of programs continually being set up to answer the needs and interests of students who wish to specialize in some facet of education. A limited number of non-teaching majors may also enroll in some of the 11 learning centers listed above by contacting the School's Undergraduate Advising Office. Students in good standing in any regular University program may become candidates for admission.

UNDERGRADUATE PROGRAMS

Elementary and Secondary School Teachers
Undergraduate majors in Education must satisfy all University graduation requirements and accumulate units according to the following general categories: 60 credits in the College of Arts & Sciences, 30 credits in the School of Education, and 30 credits to be selected as electives from whatever colleges and departments the student and adviser deem appropriate. (Note: Some of the 30 Education credits may be accumulated in the form of "Credit Modules" as outlined above.) Students will work closely throughout their educational career with an adviser to assure that they are fulfilling the requirements for teacher certification as well as developing their own unique specialty. Through the 11 Learning Centers it is expected that each student will have the opportunity to maximize his personal learning process, as well as develop capabilities

that will make him an outstanding teacher in a rapidly changing world.

Complete details on all programs beginning in September will be available in May. Students are encouraged to inquire at the

specific Center/Program offices, Undergraduate Affairs Office (Room 123A) or the Graduate Affairs Office (Room 107) concerning specific courses and credential programs.

School of Engineering

The School of Engineering offers curricula in chemical engineering, civil engineering, industrial engineering, mechanical and aero-space engineering, and electrical engineering. Each of the curricula leads to the Bachelor of Science degree in that particular branch of engineers. All curricula are accredited by the Engineers Council for Professional Development.

Engineering is the profession in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize, economically, the material and forces of nature for the benefit of mankind. An engineer requires intensive technical training but at the same time he should acquire the broad education that distinguishes the professional man from the technician. His education does not end with formal schooling but continues throughout his life as he accumulates experience.

The curricula in engineering have been carefully prepared to offer each student the opportunity to acquire the sound training in mathematics and the basic sciences of chemistry and physics upon which is built the work in the engineering sciences. In the senior year, courses are offered which enable the student to use his previous training for engineering analysis, design and engineering systems in his particular field of interest. About twenty percent of his time is devoted to studies in the social science and humanistic area. Some opportunity is provided to elect courses

from both the technical and humanistic-social fields. The curriculum of the freshman year is the same for all. Specialization to a limited extent begins in the sophomore year.

A cooperative work-study program involving alternate academic-industrial experience is presently in effect for a limited number of students. This program in addition to providing economic support for participants as they proceed through their educational careers is designed to:

- (1) Advance the professional preparation of undergraduate students by blending real world experience with their academic endeavors; and
- (2) provide industry with opportunity for more direct engagement in the responsibility of educating and training its engineering resources.

Although the curricula within the School of Engineering are shown as eight semesters (normally four years), they require up to 130 semester hours credit for satisfactory completion. This is well above the University minimum of 120 semester hours for a degree and it requires intensive work in Mathematics, Science and Engineering. As a result even students in good academic standing may be required to extend their programs into a 9th and sometimes a 10th semester.

FRESHMAN ENGINEERING

All new students in engineering are enrolled in the Freshman Engineering Program until qualified to enter into a degree program. This is normal upon satisfactory conclusion of the uniform freshman year.

COURSE REQUIREMENTS— FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Rhetoric 100	3
Math. 122 or 123	3
Chem. 111 or 113	3
Engin. 103 or 104	3
Soc. Sci. Elective	3
P. E. 100	1
	—
	16
<i>Second Semester</i>	<i>Credits</i>
Rhetoric Elective	3
Math. 124 or 125	3
Chem. 112 or 114	3
Engin. 103 or 104	2
Physics 161	4
P. E. 100	1
	—
	16

AGRICULTURAL ENGINEERING

The program is administered by the College of Agriculture and is described on Page 76.

CHEMICAL ENGINEERING

Chemical Engineering centers around the creation, development, design and operation of processes for bringing about chemical and certain physical changes in materials. Chemical Engineers may be engaged in any of a wide range of activities concerned with converting an idea to a profit. These include research and development, economic and market analysis, design, construction, operation, production supervision, sales, technical service, and management. Basic research for new knowledge, teaching, and consulting also offer challenging and rewarding careers for many chemical engineers. Chemistry, physics and mathematics are the underlying sciences of chemical engineering and economics is its guide in practice.

Chemical engineers are in demand not only by industries manufacturing chemicals in the narrow sense of the word but also by all of the many related "chemical process industries," including petroleum refining and petrochemicals, plastics, synthetic fibers and textiles, pulp and paper, drugs and pharmaceuticals, natural and synthetic rubber, foods, soaps and detergents, paints and synthetic coatings, gas and coal chemicals, steel and all the metal manufacturing industries, and many others. Much of the work of the atomic energy program is chemical engineering, and new fields to which chem-

ical engineers are contributing include biomedical, environmental, and ocean engineering.

CIVIL ENGINEERING

Civil Engineering is concerned with all kinds of construction—buildings, bridges, highways and railways, airports, rivers and canals, harbors, dams, pipelines, etc. Transportation, the efficient and economical transfer of people and goods from place to place, is another concern to civil engineers. They are also deeply involved in providing adequate and safe supplies of water for homes and industries, in controlling and limiting the pollution of lakes, streams and oceans, and of the atmosphere. Civil engineers have assumed major responsibilities in ocean engineering, for example, for construction and other operations, for underwater exploitation of mineral and other resources in the seas, and for planning and organizing the transportation that will be required eventually in regions of underwater activity. There are various specialized areas of civil engineering which make essential contributions to the programs that have been mentioned, for example, hydraulic engineering and fluid mechanics, soil mechanics and foundations engineering, surveying and mapping, structural engineering and materials engineering.

In every area of Civil Engineering there is the choice of a wide range of activities: research to obtain new knowledge, development of practical methods and design utilizing existing knowledge and the results of research, designing projects which satisfy known requirements, planning activity which attempts to achieve maximum economy and efficiency, construction according to plans and specifications, and operation and maintenance. In addition, civil engineers are always deeply involved and are frequently in charge of large-scale projects which involve many fields of activity and require the coordination of the efforts of individuals of a wide variety of backgrounds, such as urban planning, water resource management, and transportation systems. In general, Civil Engineering is a field of activity which is concerned with the public well-being through protection and control of our environment.

ELECTRICAL ENGINEERING

Electrical Engineering is the application of electrical and mathematical principles to the solution of engineering problems, and to the design of the electrical and electronic equip-

ment of the future. A wide variety of electrical systems will serve mankind by performing important and complex tasks. Modern communication systems, high speed computers, and bio-medical instrumentation are just a few of the creations of electrical engineers. Because of the diversity of the electrical engineering education, graduates will be employable in sales, production, design, development, research, and management positions.

The undergraduate curriculum is designed to prepare each student for work in any of these fields and to serve as a basis for further specialization. As continued study after graduation is essential in this rapidly growing field, basic physical and systems principles are emphasized in the undergraduate program. Courses taken outside of the department in liberal arts and other engineering disciplines provide the student with a broader understanding of engineering and its relationship to other fields.

A new program leading to a degree of Bachelor of Science in Computer Systems Engineering is awaiting approval, and should be available in September of 1970. Further information on this new program may be obtained from the Department of Electrical Engineering.

INDUSTRIAL ENGINEERING

Industrial engineers are concerned with the design, installation and improvement of integrated systems of men, materials and equipment. These systems are found in nearly all organizations (manufacturing and production, government, financial, health service, and sales to name a few) and at all levels within these organizations. Consequently, the placement of industrial engineers is varied. Also, since the responsibility of an industrial engineer normally

spans several functional areas, he acquires an excellent background for management positions.

The curriculum is very flexible. The eleven required courses (33 credit hours) in the Industrial Engineering Department stress the quantitative approach to decision problems. Since the areas of application are so varied, a block of nine courses (27 credit hours) are set aside so that each student may design a curriculum which matches his particular interest. This segment is developed in conjunction with his adviser and may emphasize a particular area of application and/or the development of more sophisticated methodology. Because continued education is a necessity, students completing the program are prepared for both professional employment and graduate work.

MECHANICAL AND AERO-SPACE ENGINEERING

Mechanical and aero-space engineers use the principles of dynamics, solid mechanics, fluid and gas dynamics, heat transfer, thermodynamics, and materials science together with mathematical and computer methods for application to research, development, design, and management in industry, government and engineering education.

Students may choose to major in either Mechanical or Aero-space Engineering. Mechanical engineers design and analyze a wide variety of systems in fields such as manufacturing, energy conversion, and transportation. Aero-space engineers design and analyze systems for aircraft and space such as propulsion, astrodynamical, and vehicular. Both curricula are fundamental and flexible so that students may prepare for either professional employment or graduate study.

School of Home Economics

Home Economics encompasses areas of study which apply the principles and concepts of fundamental arts and sciences to the physiological, psychological, social and economic environmental needs of man.

The School of Home Economics has five departments: Human Development (HD); Home Economics Education (HEEd.); Management and Family Economics (MFE); Nutrition and Food (NF); and Textiles, Clothing and Environmental Arts (TCEA). The letters in parentheses are area codes. Within these five departments the following undergraduate majors are offered:

- Child Development
- Dietetics and Institutional Administration
- Fashion Merchandising—Retail Executive Internship
- Foods in Business
- Human Development
- Interior Design and the Environmental Arts
- Secondary Education and Extension
- Textile product promotion, textile and apparel journalism, consumer services and market research

The undergraduate program of the School, leading to a Bachelor of Science degree, emphasizes a liberal education in the sciences, arts and humanities with specialized instruction as preparation for professional careers. The transitional continuing relationships between liberal and professional education seek to develop in the student a disciplined mind, mental curiosity and professional competence.

Professional home economists and others trained in related areas serve individuals, families, and communities through schools and colleges, extension programs, business organizations of many kinds all over the world, community and government organizations and agencies, newspapers, magazines, radio and television. Representative types of activities

include teaching, research, writing, dietetics, extension work, interior decoration, fashion merchandising, food consulting, food service management and product development.

HUMAN DEVELOPMENT

The area of Human Development is of necessity interdisciplinary in nature. The program brings together knowledge from Psychology, Sociology, Anthropology, Anatomy, Physiology, Genetics, Nutrition, Education, and the Arts and relates it to Human Development and Early Childhood Education. It is concerned with all maturational and environmental effects upon developing individuals, and with all theoretical and empirical descriptions of how this development occurs.

There are two undergraduate fields of specialization in this area. One is entitled *Child Development*. The Child Development program prepares the student for work in various types of programs serving young children, such as laboratory, public, and private kindergartens and nursery schools, Headstart programs, clinics for exceptional children, hospital recreation programs and community and welfare agencies. Students qualify for a teaching certificate in the state of Massachusetts.

Directed experience with the children of the laboratory school and their families and with children in specialized schools and clinics provides the opportunity for students to develop a sound personal philosophy of early childhood education and child development. More intensive specialization for qualified students may be obtained by the election of a one-semester affiliation with Merrill-Palmer Institute in Detroit, Michigan, which specializes in the study of human development and family life.

The other area of specialization is *Human Development*, for those interested in studying the entire life span.

Both the Child Development curriculum and the Human Development curriculum provide a good background for graduate work in various other child-serving professions, and for graduate study in the science of human development, psychology, and sociology.

HOME ECONOMICS EDUCATION

Home Economics Education is a field of study which is particularly sensitive to changes and conditions affecting homes and families. Like many other disciplines, Home Economics Education deals with several specialized areas: (1) Family Life Education; (2) Child Development; (3) Nutrition and Food; (4) Clothing and Textiles; (5) Management and Family Economics; (6) Housing, Home Furnishings and Equipment. Never before has the need for knowledge in the related root disciplines of Psychology, Sociology, Economics, and Chemistry been so apparent and so great. Thus, the undergraduate work in various other child-serving education combines a broad liberal education with professional preparation. This curriculum provides a good background for further work at the graduate level.

The graduate of Home Economics Education who possesses a keen knowledge and understanding of her field in addition to skills in human relations and the ability to motivate and implement creativity is greatly in demand by: (1) the secondary and post-secondary schools; (2) Cooperative Extension Service; (3) the agencies for international development; (4) Peace Corps, Vista and Urban Extension; (5) business.

A semester affiliation with the University of New Mexico or Merrill-Palmer Institute in Detroit may be arranged for students who meet necessary qualifications.

NUTRITION AND FOOD

The Department of Nutrition and Food offers two majors: Dietetics and Institutional Administration, and Foods in Business. The curricula for the majors contain courses in nutrition and food combined with courses which give students a strong foundation in the Arts and Sciences.

The curriculum for *Dietetics and Institutional Administration* prepares the student for the following positions: therapeutic, administrative, teaching or research dietitian; teaching or research nutritionist in public or private agencies. The program meets the

basic requirements of the American Dietetic Association for admission to approved dietetic internships, and offers opportunities for doing subsequent course work leading to advanced degrees.

The curriculum for *Foods in Business* is based on professional training in nutrition and food combined with other selected courses in home economics, the humanities, western cultures, social sciences and business. The program is designed for the student who is oriented to the business world, and leads directly into development and promotion with food, equipment and utility industries. Positions are open in the field of communications for the student who combines her or his knowledge of nutrition, food and equipment with competence in journalism, English, speech, television and radio. Positions are also available in advertising and public relations agencies or with consulting firms. This curriculum offers opportunities for doing subsequent course work leading to advanced degrees.

TEXTILES, CLOTHING AND ENVIRONMENTAL ARTS

The emphasis of the Textiles, Clothing and Environmental Arts major may be in fashion merchandising, interior design and environmental arts or a more diversified program promoting textile and apparel journalism, consumer services and marketing research. The professional opportunities associated with clothing, textiles, home furnishings and related merchandise are limitless. They include positions with manufacturers, producers, retailers, consumer groups, as well as educational institutions and social and government agencies. The student who is interested in the business field pursues, by specializing in this area, a curriculum with a strong program of liberal arts emphasizing the social sciences. Courses which build on this foundation providing professional business competency include fundamentals of clothing, textiles, fashion, environmental arts, and interior design as well as courses in business and related subjects.

School of Nursing

The baccalaureate nursing program is designed to prepare the qualified high school graduate for a career in professional nursing, admission to a graduate program in Nursing, as well as for the responsibilities of family and community life.

A limited number of qualified Registered Nurses interested in completing the requirements for a bachelor's degree are admitted for full time study each fall.

In nursing, a profession of personal service, people are the focus and promoting health is the fundamental aim. The professional nurse provides a direct unique service to individuals and families, and, in addition, participates in the provision of the unique services with other health disciplines. The baccalaureate program in nursing provides opportunities for the student to gain a body of knowledge, skill and understandings appropriate to the practice of professional nursing. The scope of these learnings and the degree of skill in their application are such that individuals are enabled upon completion of the program to function effectively in beginning positions in a variety of nursing situations. These include the ability to provide competent nursing care to patients and families in the hospital, home and community; to participate with allied professional and citizen groups for the improvement of total health services to individuals and communities; to participate in organizing, planning and directing the work of nursing technicians and assistants. The baccalaureate program provides a foundation for graduate study in nursing and other disciplines, through which the nurse may become prepared for positions in a clinical specialty, teaching, supervision, administration, consultation and research.

Competence in professional nursing requires a comprehension of and the ability to apply scientific principles and tech-

niques from the physical, biological, and behavioral sciences and a capacity to become therapeutically involved in a variety of human situations. Toward this end, the nursing program provides a solid foundation in the liberal arts. Baccalaureate nursing students share the intellectual and social stimulation of college with their fellow students from all other departments of the University. Nursing courses are major subjects within this general context. The program provides the opportunity for the student to develop individual interests and potentialities through elected and independent study.

With the use of a systematic problem-solving approach, the student learns to identify nursing problems, select and develop appropriate nursing intervention and evaluate nursing care in a variety of clinical and community settings. The clinical aspects of the program are concentrated in the junior and senior years, when instruction and a correlated practicum are offered each semester under the guidance and supervision of the nursing faculty of the University. Clinical programming is accomplished through the utilization of the resources of the following cooperating agencies: The Springfield Hospital Medical Center, Wesson Memorial and Wesson Maternity, The Shriners Hospital for Crippled Children and The Municipal Hospitals in Springfield; The Cooley Dickinson Hospital in Northampton; the Northampton State Hospital; the Visiting Nurse Association of Springfield; the Springfield Health Department and other community health, educational and welfare services.

The Bachelor of Science degree, awarded upon completion of this program, qualifies the graduate for admission to the State Board Examination in Nursing. If achievement in these examinations is satisfactory, the candidate receives legal status as a registered nurse

within the state and the legal right to practice as a professional nurse.

The program is accredited by the Massachusetts Board of Registration in Nursing and the Accrediting Service of the National League for Nursing.

SCHOOL OF NURSING
FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Rhetoric 100, Language and Writing	3
Chemistry 101 or 111, General	3
Sociology 101, Introduction	3
*Elective (Social Science)	3
†Nursing 100, Introduction	3
General Physical Education	1
	—
	16

<i>Second Semester</i>	<i>Credits</i>
Rhetoric 110, Language and Speaking	3
Chemistry 102 or 112, General	3
Psychology 101, General	3
*Elective (Social Science)	3
†Nursing 100, Introduction	3
General Physical Education	1
	—
	16

*Elective chosen from: History, Government, or Economics. Students wishing to elect a foreign language may do so providing the basic requirement of the six elective credits indicated above is fulfilled prior to graduation. If the language is elected, intermediate proficiency is required.
†May be taken either semester.

School of Physical Education

The School of Physical Education includes the Departments of Physical Education for Men, Physical Education for Women, Recreation, and Athletics. It offers majors in physical education and in recreation. Other programs in the School include the general physical education program, the intramural sport program, and the intercollegiate athletic program.

GENERAL PHYSICAL EDUCATION PROGRAM

This program offers instruction in sport, dance, and other forms of physical activity to all undergraduate students in the University. Each student must fulfill a requirement through one of the following media: (1) by taking a one-semester, 2-credit course on a graded basis (2) by taking two semesters of 1-credit courses on a graded basis or (3) by taking either of the above options on a pass-fail basis.

One of the few certainties facing college graduates is that they will be continually faced with choices regarding physical activity. Burgeoning leisure time, increasing spectator interest in sport, increasing opportunity to participate in carry-over sports such

as golf, tennis, bowling, and sailing, as well as jogging and fitness programs, and increasing exposure to concern of medical people, particularly cardiologists, about inactivity, insure continued contact with the idea of physical activity and sport.

Some students enter the University with a background that enables them to fully appreciate and achieve satisfaction from participation in a sport and/or physical activity program. However, others are limited by insufficient preparation at earlier age levels. The General Physical Education Program at the University offers (1) the opportunity for self-assessment in terms of skill competencies and fitness components and (2) the opportunity to gain the ability to assess and interpret a wide variety of programs involving sport and physical activity as they relate to the individual's well-being.

The student has almost unlimited choice in selecting his or her specific courses. This includes numerous sport skill courses, dance courses, conditioning course, as well as theoretical courses (classroom instruction and laboratory work) in which the student receives instruction in regard to the "why" of sport and physical activity. During the summer orientation period, each student

takes a screening test in swimming which is used for diagnostic purposes. Swimming instruction may be recommended if the student cannot swim. The test is also used to determine a student's eligibility for various aquatic courses.

MAJORS' PROGRAM

The Department of Physical Education for Women and the Department of Physical Education for Men cooperatively offer a co-educational program for those students who wish to pursue physical education as a major field of study. Two major options are available in the program. Students may elect to follow either the teacher education program or the related disciplines program which includes study in exercise science or the theory of sport. The teacher education option offers further opportunity for specialization. A student may select any one of the following concentrations: secondary education, elementary education or special education. Similarly, a number of concentrations are available through the related disciplines program. They are: dance, exercise physiology, kinesiology, sport history, sport psychology, and sport sociology.

The dance concentration affords a student the opportunity of starting course work in the freshman year. The program is designed to allow a student to gain depth in not only the art of dance, but other related areas. In addition, in the senior year a student may choose the student teaching semester to meet certification requirements or select more advanced courses preparing for future academic or professional study.

Each student is expected to select his or her area of concentration during the second semester of the sophomore year. The first two years of study are essentially the same for all students majoring in physical education. During these two years the student will fulfill the University core requirements and the physical education core requirements. The only variances from one student's program to another will occur as a result of electives available within these requirements. The physical education core consists of the following courses:

<i>Courses</i>	<i>Credits</i>
PE 141—Human Anatomy	3
Prerequisite: Zoology 101	
PE 142—Kinesiology	3
Prerequisite: PE 141	
PE 278—Physiology of Exercise	3
Prerequisite: Zoology 135	

A student will select *three* of the following four courses:

PE 200—Sociology of Sport and Physical Activity	3
Prerequisite: Sociol. 101	
PE 201—Psychology of Sport and Physical Activity	3
Prerequisite: Psych. 101	
PE 202—History of Sport and Physical Activity	3
Prerequisite: History 100 or 101	
PE 203—Philosophy of Sport and Physical Activity	3
Skills and Coaching Courses	*14
Total	*32

*Only 8 of the 14 credits in skills and coaching courses will generally be taken during the first two years. Thus the student actually completes 26 credits in the physical education core during the freshman and sophomore years.

The recommended program for these first two years of study is as follows:

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Electives (C, D, E)(Select 2)	6
Zoology 101 Intro. Zoology	3
PE Skills	2
Rhetoric 100 or 110	3
	—
	14

<i>Second Semester</i>	<i>Credits</i>
Elective	3
Electives (C, D, E)(Select 2)	6
Zoology 135 Intro. to Physiology	3
PE Skills	2
Rhetoric Elective	3
	—
	17

Electives: Soc. 101 (D), Psy. 101 (D), Hist. 100 or 101 (C), Phil. 105 (C). These are prerequisites to Physical Education Core Courses.

SOPHOMORE YEAR

<i>First Semester</i>	<i>Credits</i>
English 125 Mast. of West. Lit.	3
PE 141 Human Anatomy	3
*PE 200, 201, 202, 203 (Select any 2)	6
PE Skills	2
Electives	3
	—
	17

<i>Second Semester</i>	<i>Credits</i>
English 126 Mast. of West. Lit.	3
PE 142 Kinesiology	3
*PE 200, 201, 202, 203	
(Select any 1)	3
PE Skills	2
PE 278 Phys. of Ex.	3
	—
	14

*The student must take 3 of these 4 courses during the sophomore year. They may be taken in any order provided the prerequisites have been met.

RECREATION

The professional in recreation is a diagnostician of the leisure needs of people and a developer and provider of opportunities to meet these needs. He works primarily at the executive, administrative and supervisory levels, although a few settings involve more direct program leadership.

Options are available leading to a variety of careers in: voluntary youth-serving organizations, college unions, military establishments, municipal and other governmental agencies, and commercial and private enterprises; as well as in hospitals and other institutions and agencies dealing with the ill, the handicapped, and other types of dependents. An option is also available in environmental interpretation.

The curriculum presented below represents a core program. After becoming familiar with the various career opportunities the student will consult with his adviser to select an appropriate option. He will then devote not less than eighteen of his elective credits to courses identified in the current departmental list for that option.

In addition to completing the curric-

ulum as described below, the student is required to:

- 1). Devote one summer (minimum of six weeks) to a recreation position, preferably with pay, in a camp, playground, or similar setting approved by the Department.
- 2). Possess a Red Cross Advanced First Aid Certificate, or equivalent.
- 3). Demonstrate proficiency in at least one program area.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Humanities & Fine Arts	
Elective	3
Math. or Nat. Science Elective	3
Arts & Sciences Elective	3
Sociology 101 Intro. to Soc.	3
PE 100	1
Rhetoric 100 or 110	3
	—
	16

<i>Second Semester</i>	<i>Credits</i>
Humanities & Fine Arts	
Elective	3
Math. or Nat. Science Elective	3
Arts & Sciences Elective	3
Psychology 101 Intro. to Psych.	3
PE 100	1
Rhetoric Elective	3
	—
	16

DEPARTMENT OF ATHLETICS

Members of the athletic department are responsible for the conduct and administration of the various phases of the intercollegiate and intramural athletic programs at the University.

Department of Public Health

The curriculum in Public Health is designed to prepare qualified University applicants for health career opportunities or further study in environmental health sciences, and community health and health education.

The department also provides a course of study in Medical Technology. Students are expected to generally follow the course sequence outlined below. A minimum of 32 major credits is required of all students for the Bachelor of Science degree. Credits from other University departments are included in these major credits. The Master of Science degree is also offered in the Department of Public Health. (See Graduate Catalog.)

ENVIRONMENTAL HEALTH (Public Health Option I)

Designed to prepare for career opportunities in radiological health, industrial hygiene, environmental sanitation, occupational health, public health laboratory, etc., or further study at the graduate level requiring specific technical knowledge and competence.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Rhetoric 100 or 110	3
Math. 123	3
Chem. 111	3
Zool. 101	3
Psych. 101 or	
*Sociol. 101	3
General Phys. Ed.	1
	—
	16

<i>Second Semester</i>	<i>Credits</i>
Rhetoric Elective	3
Math. 124	3
Chem. 112	3
Zool. 135	3
Sociol. 101 or	
*Psych. 101	3
General Phys. Ed.	1
	—
	16

*May be taken either semester.

If a language is elected, intermediate proficiency is required.

COMMUNITY HEALTH AND HEALTH EDUCATION (Public Health Option II)

Designed to prepare for first level career opportunities in community health education, health services administration, non-medical administration, health program development, epidemiology, health statistics, etc., or for further study at the graduate level requiring specific professional and technical competence.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Rhetoric 100 or 110	3
Math. 123	3
Chem. 111	3
Zool. 101	3
Psych. 101 or	
*Sociol. 101	3
General Phys. Ed.	1
	—
	16

<i>Second Semester</i>	<i>Credits</i>
Rhetoric Elective	3
Math. 124	3
Chem. 112	3
Sociol. 101 or	
*Psych. 101	3
†Elective	3
General Phys. Ed.	1
	—
	16

*May be taken either semester.

†Elective chosen from Humanities.

If language is elected, intermediate proficiency is required.

MEDICAL TECHNOLOGY

The program sequences outlined below are recommended for young men and women who are interested in the wide variety of career opportunities available in Medical Technology. Medical Technology graduates are eligible for laboratory positions in hospitals, clinics, health departments, pharmaceutical firms, and medical research foundations. The course of study is intended also to prepare students for continuation at the graduate level.

There are presently two courses of study which a Medical Technology major may option in pursuit of a Bachelor of

Science degree. Students electing Option I are required by the affiliated hospital schools of Medical Technology to have maintained averages of "C" or better in their science and mathematics courses. These students must have earned a total of 90 academic credits and satisfied the departmental and university curriculum requirements before beginning their hospital internship. Transfer students must, in most cases, elect Option II.

Option I. This curriculum consists of a three-year academic program followed by a 12-month internship in an accredited school of Medical Technology affiliated with the University. After successful completion of the 12-month internship and after satisfying the requirements of the department, a student will receive a Bachelor of Science degree in Medical Technology. A total of 130 academic credits is necessary for graduation with this option. Forty academic credits are earned during the fourth year, upon successful completion of the internship.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
Rhetoric 100	3
Math. 111 (if necessary)	3
Zool. 101	3
Chem. 111 (General)	3
†Social Science or	
Foreign Language	3
‡Phys. Ed.	1
	—
	16

<i>Second Semester</i>	<i>Credits</i>
*Rhetoric	3
Math. 123	3
Zool. 145 (Human Genetics)	3
Chem. 112 (General)	3
†Social Science or	
Foreign Language	3
‡Phys. Ed.	1
Medical Technology 101	3
	—
	19

*Rhetoric 110, 140, 145, 160, 165 or 170.
 †Intermediate proficiency is required if a foreign language is elected to fulfill the University's requirement.
 ‡Two credits required; to be explained by Physical Education Dept.

Option II. This is a four-year academic program leading to a Bachelor of Science Degree. Following graduation, the student will be assisted in arranging for a 12-month internship in an accredited school of Medical Technology. The student must complete all of the requirements established by the American Society of Clinical Pathologists to qualify for the Registry of Medical Technology. A total of 120 academic credits is necessary for graduation with this Option.

Students electing Option II should follow Option I program for Freshman, Sophomore and Junior years.

Division of Military and Air Science

The Division of Military and Air Science includes the Department of Military and the Department of Air Science. Both departments offer Reserve Officer Training Corps (ROTC) commissioning programs that enable the University graduate to fulfill his military obligation as a commissioned officer. Students who have completed a four-year or a two-year program may be commissioned in the respective services upon graduation from the University.

Students may register for the first course of the four-year program at the same time they register for other University courses. No formal application is required. Upon successful completion of the first two years, the student then may apply for admission into the final two years of the ROTC program.

The two-year program requires that the student have two academic years remaining at either undergraduate or graduate level. Successful completion of a six-week program on a military installation during the summer prior to enrollment is a prerequisite for these students. Those interested should apply two academic semesters before enrollment, since processing must be completed six months before the start of the fall semester. The two-year program is available to transfer students and students unable to participate in the four-year program.

Both departments offer scholarship assistance to qualified students. University tuition, fees, textbook allowances, and lab expenses, plus a stipend of \$50 per month are received with a scholarship. Non-scholarship students receive a monthly stipend of \$50 for the final two years of the four-year program or for both years of the two-year program.

Participation in the ROTC programs is voluntary. Uniforms and textbooks are provided and course credits apply toward graduation requirements in varying amounts depending on school of enrollment within the University.

Qualified students interested in becoming military pilots may participate in the Flight Instruction programs of the departments. Completion of a program leads to pilot qualification in Army Aviation or the Air Force. In addition to actual flight instruction, students take ground instruction in weather, navigation, and FAA regulations.

Students with previous military training may have this experience credited toward all or part of the first two years of the four-year program. Individuals with prior active service, previous ROTC training, military school attendance, Civil Air Patrol training, or service academy attendance should consult the departments.

In their senior year, students may request a delay in reporting to active duty in order to complete graduate work or to attend professional school.

DEPARTMENT OF MILITARY SCIENCE

A program of general military subjects is presented by the Department of Military Science which qualifies the University graduate for a commission in any of the seven combat and seven non-combat branches of the United States Army. Thus, regardless of which academic major study program a student chooses, he will find appropriate leadership opportunities open to him in the modern Army upon graduation and attainment of a commission.

The program consists of a basic course, Freshman and Sophomore year, and the advanced course, Junior and Senior year. During the basic course students are introduced to all phases of military science; the Defense Establishment, Branches of the Army, Military History, and Map Reading and Tactics. The advanced course provides instruction on Command and Staff, Tactics and Methods of Instruction and prepares a student for his tour of active duty as an officer.

Students participate in leadership laboratory during the basic and advanced course. The purpose of leadership laboratory is to learn customs and courtesies of the Army and to provide experience in leader-

ship, management, and discipline. The advanced course plans additional field exercises and participate in field trips to military installations on the eastern seaboard. No academic credit is granted for leadership laboratory and field Trips.

Cadets designated as Distinguished Military Students, by reason of their achievement in academic and military studies, may apply for a commission in the Regular Army. Students receiving a Reserve Commission are required to serve two years' active duty, the same as an individual drafted into the service under the provisions of the Selective Service Act. In addition to the normal four-year scholarship, one, two, and three year scholarships are offered to qualified students enrolled in the four-year program. The Professor of Military Science is responsible for the selection of students to receive these scholarships. High school seniors compete on a national basis for the four-year scholarship. The same financial benefits apply to this scholarship program as to the four-year scholarship program.

In addition to the regular military subjects, various extra-curricular activities exist for interested students. These include counter guerrilla and survival training, rifle team, and Scabbard and Blade, a national military society.

FRESHMAN YEAR

<i>First Semester</i>	<i>Credits</i>
MS 111 U.S. Defense	1
Establishment	
Fundamentals of	
Leadership	
National Defense	

<i>Second Semester</i>	<i>Credits</i>
MS 112 U.S. Defense	1
Establishment	
Fundamentals of	
Leadership	
United States and	
National Security	

DEPARTMENT OF AIR SCIENCE

The Department of Air Science offers courses of general interest to the University student and of specific interest to both male and female students who would like to prepare for and serve as officers on active duty in the U.S. Air Force. The curriculum is designed to study the need for military forces, the nature of military forces, their organization and mission with emphasis on the Air Force, and the nature of service as a professional Air Force officer. Courses en-

courage critical thinking, imagination, and a high degree of student involvement.

In the four-year program, the student enrolls in an Air Science course each semester and attends field training for four weeks between the sophomore and junior or junior and senior years. There are two major phases in the four-year program curriculum. The first phase is the General Military Course (GMC) which forms a single unit offered during the freshman and sophomore years. The studies cover the nature and causes of international conflict, the functions and employment of U.S. military forces, and defense policies in the contemporary world. This first phase carries no service commitment and is an excellent way for students to study the military and decide if they want to continue on for an Air Force commission. Enrollment in the General Military Course confers no military status on the student.

The second phase of the four-year program is the Professional Officer Course (POC) taken during the junior and senior years. Enrollment depends on academic and medical qualification and selection by the department. In the POC, academic concentration is on the preparation for service as an Air Force officer. Academically it deals with the historical development of airpower, aero-space power today, astronautics and space operations, Air Force leadership at the junior officer level, and a study of military management. The development of communicative techniques is an integral part of the POC curriculum.

A two-year program student enrolls in the POC, after the special six-week field training and receives the same instruction as a four-year POC member.

Corps Training is a non-academic, cadet-planned and directed activity centering on military customs and courtesies and the career environment of the Air Force officer. Corps Training provides practical experience in leadership and management.

Field Training involves a practical, firsthand experience with military life on an Air Force installation. Cadets receive instruction on junior officer activities, career field orientation, Air Force base functions and environment, aircraft and aircrew orientation, survival training, and physical conditioning. Applicants for the two-year program also receive academic instruction during their attendance at field training.

Scholarships may be awarded to qualified students in the four-year program.

Students compete for college scholarships that start at the freshman, sophomore, junior or senior year. High School seniors compete on a national basis for the scholarship that starts at the freshman year.

Extra-curricular activities include the Arnold Air Society, an honorary service organization that conducts activities which contribute to the overall objectives of the Air Force, and the Angel Flight which is an Arnold Air Society auxiliary composed of young ladies who participate in service projects and serve as hostesses at University, civic, and AFROTC functions.

Successful completion of the Air Force ROTC program results in the awarding of a commission as a Second Lieutenant in the United States Air Force.

The first year courses meet for one classroom hour and one corps training hour per week:

FRESHMAN YEAR

First Semester

Air Science 111

The U.S. Air Force

Second Semester

Air Science 112

U.S. Military Forces

Credits

1

Credits

1

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GEORGE E. EMERY

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Director of Admissions Center

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All correspondence concerning the *Amherst Campus* should be addressed to the appropriate office, University of Massachusetts, Amherst, Massachusetts 01002.

All correspondence concerning the University of Massachusetts at Boston should be addressed to: 100 Arlington Street, Boston, Massachusetts 02116.

All correspondence concerning the University of Massachusetts' Medical School should be addressed to: 419 Belmont Street, Worcester, Massachusetts 01604.

The New England Association of Colleges and Secondary Schools

The New England Association of Colleges and Secondary Schools accredits schools and colleges in the six New England states. Membership in one of the six regional accrediting associations in the United States indicates that the school or college has been carefully evaluated and found to meet standards agreed upon by qualified educators. Colleges support the efforts of public school and community officials to have their secondary school meet the standards of membership.

Gifts and Bequests

For the information of those who may wish to make a gift or a bequest to this University, the following suggestion is made as to a suitable form which may be used.

There are a number of worthwhile activities of the University which are handicapped by lack of funds and for which small endowments would make possible a greater measure of service to our students and to the Commonwealth. The religious work on the campus is an example. This is now carried on in a limited way by private contributions. Further information concerning this and other activities in similar need will be gladly furnished by the Development Office.

Suggested Form

"I give and bequeath to the Trustees of the University of Massachusetts, the sum of dollars,"

(1) (Unrestricted)

"to be used for the benefit of the University of Massachusetts in such manner as the Trustees thereof may direct."

or (2) (Permanent Fund: income unrestricted)

"to constitute an endowment fund to be known as the.....Fund, such fund to be kept invested by the Trustees of the University of Massachusetts and the income used for the benefit of the University in such manner as the Trustees thereof may direct."

or (3) (Specific Purposes)

"to be used for the following purposes,"

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231CE GEOGRAPHY OF SOUTHEAST ASIA

The drive for economic development, national integration and regional security in contemporary Southeast Asia. Topics include the transformation of agrarian landscapes, the socio-economic bases for insurgency, and the problem of the Mekong Basin development program.

Amherst - Tuesday

Mr. Hafner

385CE URBAN GEOGRAPHY

An inter-urban and intra-urban view of cities. An examination of the processes which produce internal variation in the city and by which systems of cities are integrated. Emphasis on processes shaping the city's internal social geography.

Amherst - Monday

Mr. Meyer

HISTORY

101CE HISTORY OF WESTERN THOUGHT AND INSTITUTIONS

The development of Western Civilization from the end of the Wars of Religion, about 1650 A.D., to the present day. Emphasis on periods of revolution, crisis and rapid social change as they affected the individual and society. Combined lectures and discussion.

Amherst - Tuesday

Mr. Goodwin

326/626CE HISTORY OF AMERICAN THOUGHT AND CULTURE

The development of American culture among various groups of its countries to population with emphasis on their thought and cultural differences.

Amherst - Wednesday

Mr. Nissenbaum

330/630CE SOCIAL HISTORY OF THE UNITED STATES

The evolving status of individuals and groups and problems of migration, livelihood, urbanization and social conflict.

Amherst - Tuesday

Mr. Richards

395/695CE SEMINAR: MODERN ISRAEL

Modern Israel, its social and political origins. The development of the state of Israel and the emergence of its present social, cultural and political structures.

Amherst - Thursday

Mr. Gunner

001CE THE MODERN NEW EAST

A series of three evenings surveying the Modern Near East in depth with emphasis on the emerging nationalism of the Arab peoples and their confrontation with Israel. For teachers and the interested public.

Amherst - Wednesday

Cost \$15. Non-credit. Mr. Kirk

March 10, 17, 24

002CE EAST ASIA TODAY

Three evening meetings examining the present status of East Asia for interested teachers and the educated public. Stress will be laid on China and Japan and the process of rapid change at work in both countries.

Amherst - Monday

Cost \$15. Non-credit. Mr. Drake

April 5, 12, 19

LIBRARY SCIENCE

502CE LIBRARY ADMINISTRATION

Libraries and their governing agencies, scientific management, principles, organization and operation of library departments, personnel problems and procedures, budget preparation, statistics, quarters and planning. Offered in cooperation with the School of Library Science of the University of Rhode Island.

Amherst - Saturday

Cost \$90. Mrs. Greenbie

LINGUISTICS

201/501CE GENERAL LINGUISTICS

Introduction to the principles and methodology of theoretical linguistics with specific reference to the theory of transformational grammar. Topics and problems in English grammar, as analysed and explained by linguists using the transformational approach. How the transformational approach (the "New Grammar") differs from more traditional approaches to English grammar. Simple grammatical analysis by the student. While the course does not deal with specific teaching methods, it should be of value to English teachers interested in new approaches to English grammar. No prerequisites.

Amherst - Wednesday

Mr. Akmajian

MANAGEMENT

201CE PRINCIPLES OF MANAGEMENT

A broad view of the management process from historical, theoretical, and practical viewpoints. Emphasis on the systems, behavioral, and quantitative aspects of the managerial process in various organizational settings.

Amherst - Monday

Mr. Gray

241CE PERSONNEL MANAGEMENT

Issues and concepts in the areas of personnel management and industrial relations. Attention to the contexts of personnel management, personnel management functions, and the changing nature of personnel administration. Focus on analyzing concepts and practices in view of current research knowledge of the relevant social sciences: economics, sociology, and psychology.

Amherst - Tuesday

Mr. Bjornlund

MUSIC

001CE INTRODUCTION TO THE RECORDER

The rebirth of interest in music of olden times has received impetus from the increasing popularity, particularly in amateur circles, of the recorder. Techniques of tone production, articulation, and fingering of this rather easy-to-play instrument, the predecessor of the modern flute. Following a brief historical background and survey of fundamental music notation, the vast music literature of the Middle Ages, Renaissance, and Baroque Eras (as well as folk music of many nations) will be utilized as the class learns to play in ensembles of up to six parts.

Amherst - Monday, 7-8 p.m. Class limit - 12.

Mrs. Tanner

Cost \$35, including cost of soprano recorder. Non-credit.

002CE INTRODUCTION TO THE VOICE

Fundamentals of voice production — the co-ordination of posture, breathing, phonation, and articulation. In-class experiences in the performance of a variety of song literature, with corresponding discussion of related problems.

Amherst - Monday, 7-8 p.m. Class limit - 12.

Mr. d'Armand
Cost \$40. Non-credit.

003CE INTRODUCTION TO THE PIANO

Recent acquisition by the Department of Music of an electronic piano laboratory permits group study of this ever-popular and useful instrument, allowing the instructor to listen and talk to one player at a time or all together (through the use of a master console and individual head-sets). Includes study of music notation, with emphasis on the development of fundamental motor ability and the coordination of mind and muscle. Some work in harmonizing well-known melodies and in the art of improvisation may be included.

Amherst - Tuesday, 7-8 p.m. Class limit - 12.

Mr. Harry

Cost \$35. Non-credit.

101CE INTRODUCTION TO MUSIC

Open to all students not majoring in music. Previous musical training not required. Basic music materials, principles of design, and cultural significance of representative works from the Ninth Century to the present studied and discussed.

Amherst - Wednesday

Mr. Chesnut

PSYCHOLOGY

270/570CE PERSONALITY

Theoretical developments in personality from Freud to modern times. Emphasis on psychotherapy, behavior therapy, aggression, anxiety, and human sexuality. Readings involve theoretical, empirical, and clinical literature.

Amherst - Tuesday

Mr. Simonson

301/601CE EDUCATIONAL PSYCHOLOGY

Psychological facts and principles of development, learning, and measurement as applied to educational situations.

Amherst - Thursday

Mr. Emrick

RECREATION

230CE GROUP LEADERSHIP

Methods and foundations for leadership of groups. Analysis of the group, group membership, and group process. Theories of leadership and techniques for working with large and small groups. Among topics considered from the practical viewpoint are motivation, participation, functional roles, communications, and interaction.

Amherst - Tuesday

Miss Sherrow

RHETORIC

175CE RHETORIC OF MODERN MEDIA

An analysis of the functions of oral discourse (to inform, persuade and entertain) in terms of mass media influence. Emphasis on how media affect the style and content of oral discourse. Includes viewing and listening as well as discussion and written evaluation of media content.

Amherst - Monday

Lab fee \$15. Mr. Shelby

SPANISH

181CE ORAL SPANISH

An opportunity to sharpen pronunciation and to increase fluency through conversation practice and study of vocabulary and structure. Prerequisite, Spanish 140 or permission of instructor. Two evenings per week. Class limit - 15.

Amherst - Wednesday-Thursday, 7-9 p.m.

Mr. Shakespeare

290CE SPANISH MASTERPIECES IN TRANSLATION

The best of a great literature in English. Readings in the Spanish novel, drama and essay, including an interpretation of Don Quixote. No prerequisite. One evening per week.

Amherst - Tuesday

Staff

SPEECH

115CE INTRODUCTION TO THE THEATER

Introduction to the art of the theatre: a survey of its aesthetics, elements, forms, and contributing artists; its influences and place in our culture.

Amherst - Wednesday

Staff

121CE INTRODUCTION TO MASS COMMUNICATIONS

Includes history and development, structure, roles and functions of mass communications. Standards for evaluation of mass media.

Amherst - Tuesday

Staff

201CE PUBLIC SPEAKING

Study and application of principles governing the composition and delivery of public speeches. Prerequisite, completion of the University speech requirement.

Amherst - Thursday

Mr. Weaver

223CE THE PROGRAM PROCESS IN TELEVISION

An examination of the basic program processes in television from original idea to finished program. Training and procedures involved in the technique of television production. Experience in creating and producing television programs. Evaluation of program forms.

Amherst - Tuesday

Mr. Nielsen

225CE HISTORY AND DEVELOPMENT OF THE MOTION PICTURE

Evolution of the motion picture as an international art form and social force. Analysis of form, technique and impact of film. Selected screening of representative film styles and content.

Amherst - Thursday

Lab fee \$15. Mr. Stromgren

228CE MASS MEDIA IN SOCIETY

Mass media as a major force in the American society. Emphasis on cultural, economic, political and social effects.

Amherst - Wednesday

Mr. Meyer

SOCIOLOGY

101CE INTRODUCTION TO SOCIOLOGY

The fundamental terminology of sociology and intensive discussion of selected topics from a sociological point of view.

Amherst - Tuesday

Mr. Barber

251CE URBAN SOCIOLOGY

A comparative analysis of cities and of urbanization with special reference to demographic characteristics or urban populations, urban ecology, and urban social structure.

Amherst - Tuesday

Mr. Gross

278CE CRIMINOLOGY

The nature of crimes and the factors underlying criminal behavior. The machinery of justice; the law, courts, police systems, and correctional institutions. Prerequisite Sociology 101.

Amherst - Monday

Mr. Driver

255CE SOCIOLOGY OF RELIGION

How religious beliefs affect the purposes for which people come together and organize themselves. How the organization of social institutions, both secular and religious, affects what is likely to be the religious consciousness of the individual. How religion and one's position in the secular world affect each other, the continuing secular confrontation of the church, and the conditions under which schism, sectarianism, messianism, and denominationalism arise.

Amherst - Thursday

Mr. Manfredi

STATISTICS

121CE ELEMENTARY STATISTICS

Nature of statistics; description of data; sample distribution; statistical theories and dispersion procedures; regression and correlation, time series.

Amherst - Wednesday

Mr. Dahiya

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CAMPUS CENTER

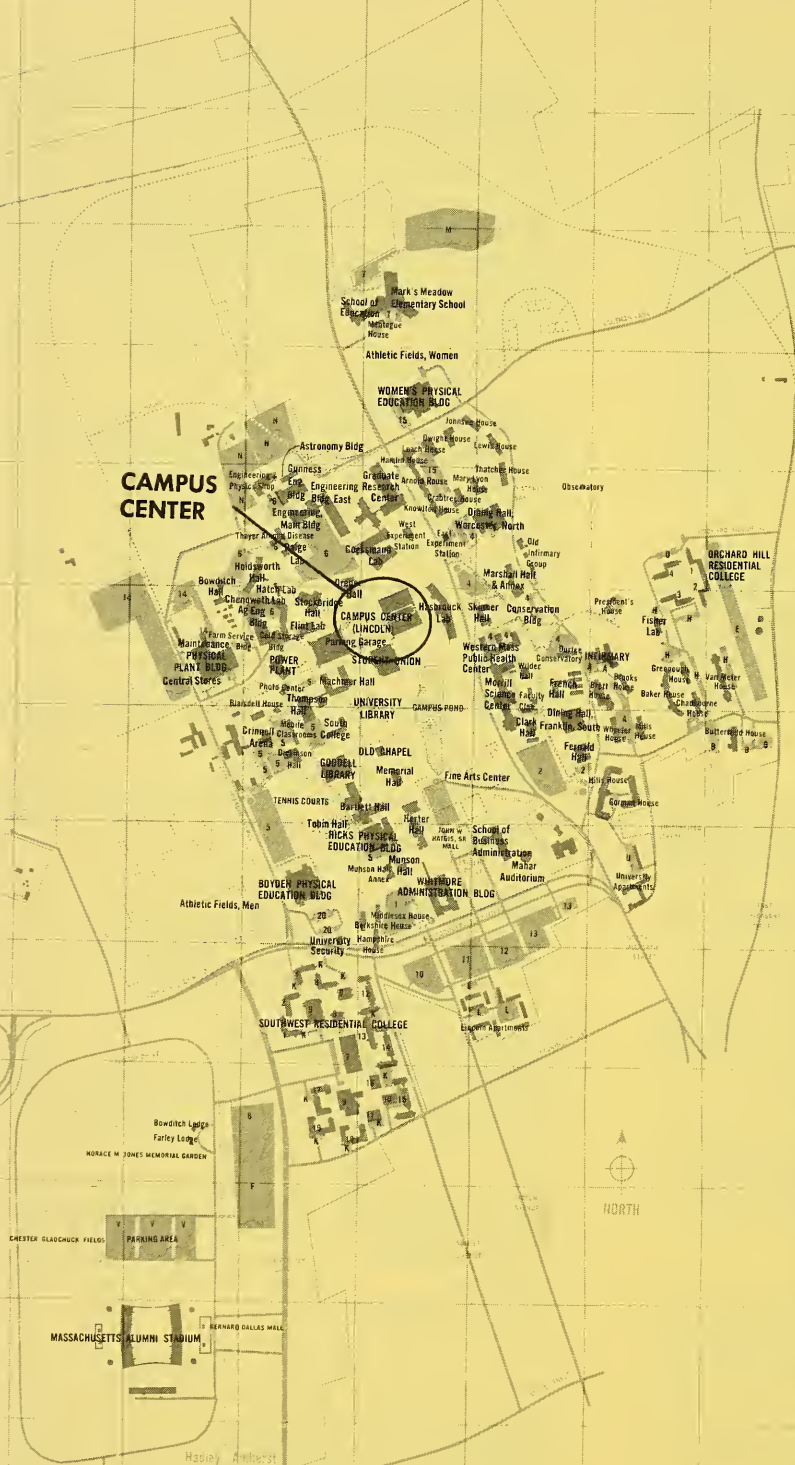
UNIVERSITY OF MASSACHUSETTS CAMPUS GUIDE

- Agricultural Engineering Bldg. — F4
Arnold House[†] — E5
Astronomy Bldg. — E4
Athletic Fields, Men — G2
Athletic Fields, Women — D5
Baker House[†] — F7
Bartlett Hall[†] — G5
Berkshire House[†] — H5
Blaisdell House — G4
Bowditch Hall — E3
Bowditch Lodge — J3
Boydell Physical Education Bldg.[†] — H4
Brett House[†] — F7
Brooks House[†] — F7
Business Administration, School of — H6
Butterfield House[†] — G8
Campus Center (Lincoln)[†] — F5
Campus Center Parking Garage 1 — F4
Central Stores — F3
Chadbourne House[†] — F7
Chenoweth Laboratory — F4
Clark Hall — G6
Cold Storage Bldg. — F4
Conservation Bldg. — F6
Crabtree House[†] — E5
Dickinson Hall — G4
Dining Hall, Franklin, South[†] — G6
Dining Hall, Worcester, North[†] — E6
Draper Hall — F4
Durfee Conservatory — F6
Dwight House[†] — D5
East Experiment Station — E5
Education, School of — C5
Engineering, Main Bldg.[†] — E4
Engineering Bldg., East[†] — E4
Engineering & Physics Shop — E4
Faculty Club — F6
Farley Lodge — J3
Farm Service Bldg. — F3
Fernald Hall — G6
Fine Arts Center (1973) — G5
Fisher Laboratory — F7
Flint Laboratory — F4
French Hall — F6
Goessmann Laboratory[†] — E5
Goodell Library[†] — G4
Gorman House[†] — G7
Graduate Research Center (1971) — E5
Greenough House[†] — F7
Grinnell Arena — G4
Gunness Engineering Bldg. — E4
Hamlin House[†] — D5
Hampshire House[†] — H5
Hastbrouck Laboratory — F5
Hatch Laboratory — F4
Herter Hall — H5
Hicks Physical Education Bldg. — H5
Hills House[†] — G7
Holdsworth Hall — E4
Infirmary[†] — F7
- Johnson House[†] — D5
Knowlton House[†] — E5
Leach House[†] — D5
Lewis House[†] — D6
Library, University (1971) — G5
Lincoln Apartments[†] — I6
Mahar Auditorium — H6
Maintenance — F3
Mark's Meadow Elementary School — C5
Marshall Hall & Annex — E6
Mary Lyon House[†] — E6
Memorial Hall — G5
Middlesex House[†] — H5
Mills House[†] — G7
Montague House — C5
Mobile Classrooms — G4
Morrill Science Center[†] — F6
Munson Hall — H5
Munson Hall Annex — H5
Observatory — E6
Old Chapel — G5
Old Infirmary Group — E6
Orchard Hill Residential College[†] — E7
1 — Grayson 3 — Webster
2 — Field 4 — Dickinson
- Paige Laboratory — E4
Photo Center[†] — F4
Physical Plant Bldg. — F3
Power Plant[†] — F4
President's House — F7
Public Health Center, Western Mass. — F6
Skinner Hall[†] — F6
South College — G4
Southwest Residential College[†] — I, J, 4, 5
1 — Emerson 10 — J. Q. Adams
2 — James 11 — Washington
3 — Melville 12 — Prince
4 — Thoreau 13 — Crampton
5 — Hampshire 14 — McKemie
6 — Kennedy 15 — Patterson
7 — Hampden 16 — J. Adams
8 — Coolidge 17 — Moore
9 — Berkshire 18 — Cance
Dining Hall 19 — Pierpont
- Stadium, Massachusetts Alumni[†] — L3
Stockbridge Hall[†] — F4
Student Union[†] — F5
Tatcher House[†] — E6
Thayer Animal Disease — E4
Thompson Hall — F4
Tobin Hall (1972) — H4
University Apartments — H7
University Security — H4
Van Meter House[†] — F8
West Experiment Station — E5
Wheeler House[†] — G7
Whitmore Administration Bldg. — H5
Wilder Hall — F6
Women's Physical Education Bldg.[†] — D5

[†]Buildings that contain Civil Defense Fallout Shelters.

[†]Buildings that are self-liquidating

- Parking Lots
 Under Construction
 Traffic Control Points



368/668CE OLD WORLD PREHISTORY

A survey of the prehistoric cultures of Europe, Asia, and Africa, with emphasis on the Paleolithic, Neolithic and early metal-using periods. This course is designed to give the student an understanding of the significant cultural developments in the Old World before the emergence of historic civilizations.

Amherst - Thursday

Mr. Proulx

386/686CE SPECIAL PROBLEMS: MAGIC AND WITCHCRAFT

A general survey of the occult side of ancient and modern civilization. Initial emphasis on anthropological, psychological, and metaphysical interpretations of the so-called "black arts," followed by relevant topics such as Medieval witchcraft, the Cabala, the I Ching, Gnosticism, Alchemy, the "black mass," and Satanism.

Amherst - Wednesday

Mr. Mulcahy

ART

115CE INTRODUCTION TO ART

The great works of art studied chronologically in their historical stylistic periods, with attention to the cultures, civilizations and socio-intellectual conditions which produced them. Selected works from Paleolithic cave art through the art of today will be examined and discussed. This course is a pre-requisite for all upper-level art history courses.

Amherst - Wednesday

Staff

100/101CE BASIC DRAWING

Drawing in black and white, applying pencil, crayon, charcoal techniques to representation in line and tone, emphasizing sound observation and effective presentation.

Amherst - Wednesday and Saturday

Staff

220/221CE

520/521CE PAINTING I

Easel painting in oil and related media, based on elementary understanding of physical properties of medium, and encouraging individual directions within limitations of sound composition. Prerequisites, Art 100, 120.

Amherst - Wednesday and Saturday

Staff

CHEMISTRY

166CE ORGANIC CHEMISTRY (FOR MAJORS ONLY)

First semester of a year course covering the preparation, properties, principal reactions and mechanisms of the common classes of organic compounds. Must be taken concurrently with 168.

Amherst - Tuesday, Wednesday. 6:30-8:00 p.m.

168CE ORGANIC LAB (FOR MAJORS ONLY)

Laboratory course covering some common laboratory techniques used in organic chemistry and some reactions of organic compounds. Must be taken concurrently with 166.

Amherst - Tuesday. 8:00-10:00 p.m. Lab Fee \$50.

EDUCATION

251CE FOUNDATIONS OF EDUCATION

Selected problems and issues in Education. The student will formulate his own thoughts and opinions taking into consideration the philosophical, sociological and historical aspects of these selected Education issues.

Amherst - Thursday

Staff

706CE SEMINAR: GUIDANCE

The nature and need for guidance and counseling services, relevant issues and dynamic innovations will be explored. Dyadic relationships, group process, institutional change, and performance curriculum in human relations are possible areas of emphasis.

Amherst - Thursday

Pittsfield - Tuesday

Staff

784CE INDIVIDUAL CASE STUDIES OF READING PROBLEMS

Practical experience in gathering and summation of information to form a case study of a child in order to determine the seriousness of the reading problem and the underlying causes and to make recommendations for their correction or remediation.

Pittsfield - Tuesday

Staff

649CE CURRENT TRENDS AND CONCEPTS IN VOCATIONAL EDUCATION

Exploration of the issues in vocational education and their implication for curriculum and administration. Consideration of funding, scheduling, staff utilization. Stresses emerging concepts resulting from a critical evaluation of research and legislation involved in the development of vocational and technical education programs.

Canton, Mass. - Tuesday 4:00-6:30 p.m. Cost \$30. Mr. Johnson (Blue Hills Regional Vocational Technical School)

ENGLISH

126CE MASTERPIECES OF WESTERN LITERATURE

Selected masterpieces, from Homer and the Bible to James Joyce or Robert Frost. Aims to enrich the student's appreciation of literary values and develop his understanding of abiding human issues.

Amherst - Tuesday

Miss Kaplan

267CE CONTEMPORARY POETRY

Significant poets who have emerged since 1945, with some attention to major poets of the earlier twentieth century.

Amherst - Tuesday

Mr. Kenseth

346CE CREATIVE WRITING: POETRY

The active writing of the student's own poetry, close critiques between instructor and the staff, and some background presentation of approaches to good poems and to the writing of poems by various twentieth century poets.

Amherst - Wednesday

Mr. Amorosi

380CE ASPECTS OF LITERATURE: LITERATURE AND FILM

Historical, formal, and aesthetic relationships between literature and the cinema, with emphasis on problems raised in literary aesthetics as a result of film. Class format will be films, lecture sessions and discussion groups.

Amherst - Tuesday

Course limit - 15

Mr. Eidsvik

262CE MODERN NOVEL 1930 - PRESENT

About a dozen representative and more or less contemporary (post World War II) English and American novels, usually devoting one week to each. Emphasis on relating each author's perceptions to modern life. The instructor has no political or aesthetic axes to grind. Writers studied will include Faulkner, Robert Penn Warren, Flannery O'Connor, William Styron, Nabokov, Ralph Ellison, John Barth, Philip Roth, Saul Bellow, Graham Greene, Evelyn Waugh, Malcolm Lowry and Lawrence Durrell.

Amherst - Thursday

Mr. Lyons

GEOGRAPHY

200CE GEOGRAPHY OF ANGLO-AMERICA

A survey of the present-day physical and cultural geography of the United States and Canada approached by topic (e.g., religion, settlement patterns, manufacturing) and region (e.g., French Canada, New England, California).

Amherst - Wednesday

Mr. Nostrand

PHILOSOPHY AND OBJECTIVES

Education may be defined as a process of observation, reflection, examination, and evaluation, resulting in personal or professional growth. Such a process can and should continue throughout life, not being limited to the formal twelve-year-plus-college format. Thus, "continuing education." The University of Massachusetts, through the Division of Continuing Education, provides diversified opportunities for those who wish to pursue an educational goal, either formal or informal.

COURSES

A wide variety of introductory courses is offered on the Amherst campus. Students may select most of these courses confidently with the expectation that they will fit into most well designed programs leading to degrees in higher education. We urge you to look into the programs offered at the community and state colleges in your area before you make a final decision on your evening education courses.

CREDIT

Courses offered for University credit in Continuing Education are equivalent in every respect to regular University courses, and appropriate standards are maintained by the instructor. In general, numbered courses beginning with 1, 2, or 3 are for undergraduate credit; and courses beginning with 5 and up are for graduate credit. A double-numbered course, such as English 233/533, indicates that the course is for either undergraduate credit or graduate credit, whichever is appropriate.

ADMISSIONS POLICY

Any person who has graduated from high school or who has a certificate of General Educational Development is entitled to enroll in courses offered by the Division of Continuing Education of the University of Massachusetts. Students may elect to take courses, where offered for credit, either on a grade or on a pass/no record basis, but enrollment in courses or programs offered by the Division of Continuing Education in no way implies acceptance as a matriculated student, either graduate or undergraduate, at the University of Massachusetts. To accomplish matriculation, students must meet the normal entrance requirements of the University at the level appropriate to their prior educational attainment.

APPLICATION

Register early by mail to insure enrollment in the course of your choice. All fees must be included with the application. A receipt and course admission information will be sent by return mail.

Make check payable to the

DIVISION OF

CONTINUING EDUCATION

920 Campus Center

University of Massachusetts

Amherst, MA.

01002

1.	_____	Last name	_____	First name	_____	Middle initial	_____
2.	Address _____ No. _____	City _____	State _____	Street _____	Zip _____		
3.	Social Security No. _____						
4.	Area Code _____	Telephone _____					
5.	List each course for which you wish to register by course title, catalog number and location.						
	Course Title _____	No. _____	Location _____	Fee _____			
	Course Title _____	No. _____	Location _____	Fee _____			
6.	Are you a High School graduate or equivalent? _____						
7.	Have you ever taken a course here before? _____						
8.	What is your present occupation? _____						
				Add registration fee	\$5.00		
				Total Enclosed \$	_____		

GENERAL INFORMATION

ASSISTANCE IN PLANNING YOUR EDUCATIONAL PROGRAM

The staff of the Division of Continuing Education is available at any time to aid you in planning toward your educational and/or vocational goals. If you have any suggestions or questions about the Program, please contact us at (413) 545-0905; we will be happy to provide you with any information that you desire.

FEES FOR ACADEMIC EXTENSION COURSES

Non-refundable Registration Fee \$5.00 per term
Courses on the Amherst Campus
(unless otherwise noted) \$75.00 per 3-credit course
Courses outside the
Amherst Campus \$84.00 per 3-credit course
In addition, laboratory fees are charged when appropriate.
These fees cover various materials, field trips, or computer time for specific courses.

VETERAN'S BENEFITS

Because the Division of Continuing Education is completely supported by student fees, no waivers of tuition apply. However, veterans may receive the normal monthly benefits from the Veteran's Administration, information about which is available from Mr. George Emery, Veteran's Coordinator, Placement and Financial Aid Office, 239 Whitmore Administration Building, University of Massachusetts, Amherst, Massachusetts 01002.

PARKING

For those participating on the University campus, parking information will be available at registration. A \$1.00 parking permit fee must be paid annually. Parking is available in the Campus Center Parking Garage for those who wish to avoid the weather. The rates are \$.25 for the first hour, and \$.15 for each additional hour. For those participating in courses offered at other institutions, parking information will be available at registration.

CLASSROOM ASSIGNMENTS

Classroom assignments will be available at registration.

TEXTBOOK INFORMATION

Textbook information will be provided during the first class meeting.

ACADEMIC CALENDAR

Mail Registration Jan. 1-Feb. 2
Registration Feb. 1, 2
Classes begin Feb. 8
Spring Recess Mar. 21-28
Final Exams Week of May 24

GRADING SYSTEM

Grades are reported according to a letter system, as follows:

A — Excellent
B — Good
C — Average
D — Passing (but not satisfactory)
F — Failing
INC — Incomplete

Students may elect to substitute a Pass (P) or No Record reporting system, although in most cases such a decision jeopardizes credit transferability.

MINIMUM ENROLLMENTS

If the enrollment for a given course does not reach 16, the course may be cancelled at the discretion of the Division of Continuing Education, and all tuition and fees will be refunded.

REFUNDS

Refunds of tuition will be made according to the following schedule with two exceptions: a) A student involuntarily called into military service before the completion of a course will be given a pro rata refund of tuition; b) Students enrolled in courses for which the minimum enrollment was not achieved (see MINIMUM ENROLLMENT above) will be given full refund.

Refund Schedule

a) Within two weeks of the beginning of the term 80%
b) During the third week 60%
c) During the fourth week 40%
d) During the fifth week 20%
e) After the fifth week no refund

Registration fees are not refundable.

Division of Continuing Education



Course Descriptions

Register early by mail to insure enrollment in the course of your choice. All fees must be included with the application. A receipt and course admission information will be sent by mail. All courses are for three credits unless otherwise noted. Courses meet from 7:00 to 9:45 p.m. unless otherwise noted.

FEES

Non-refundable registration fee \$5.00 per student

Courses on Amherst campus \$75.00 per course
(except where noted)

Courses outside Amherst \$84.00 per course

In addition, laboratory fees are charged when appropriate

REGISTER BY MAIL ON OR BEFORE FEBRUARY 2

Make check payable to the

DIVISION OF CONTINUING EDUCATION
920 Campus Center
University of Massachusetts
Amherst, Massachusetts 01002

Academic Extension
1971

Classes begin February 8

ACCOUNTING

100CE INTRODUCTION TO COMPUTERS FOR BUSINESS

The BASIC and FORTRAN computer programming language with emphasis on the use of the computer for business data processing and problem solving.

Amherst - Monday

Lab Fee \$10. Mr. Lawler

130CE INTRODUCTION TO MANAGERIAL ACCOUNTING

Continuation of Accounting 125 with emphasis on the development and application of accounting data for planning and control.

Amherst - Thursday

Mr. Sinclair

ANTHROPOLOGY

104CE INTRODUCTION TO CULTURAL ANTHROPOLOGY

The concepts and principles of cultural anthropology presented within the context of contemporary issues and cultures — the American Indian, Blacks, Chicanos, the people of Appalachia. Movies, culture contact game, role playing and guest speakers, with emphasis on using anthropology in teaching and on understanding contemporary America. A class project will apply some facet of anthropology in the student's field of special interest.

Amherst - Monday

Miss Sinton

252CE RURAL AND PEASANT SOCIETIES

A survey of rural peoples and cultures and how they adapt to their environment and to the larger society of which they are a part. The capacity to absorb or resist change and the future of peasantry in industrialized mass societies. Village life, ideology, economy and the impact of technology and industrialization.

Amherst - Tuesday

Mrs. Zube

364/664CE PROBLEMS IN ANTHROPOLOGY

A general introduction to basic anthropological theory precedes a survey of traditional ethnographies and other contemporary literature that could be presented in junior or senior high school social science classes. Concurrently with the readings, techniques for presenting such material are discussed. Finally, the anthropological viewpoint is considered in relation to an understanding of and possible solutions for current social problems in the United States.

Springfield - Monday

Miss Morth

365CE WORLD ETHNOGRAPHY

Focuses on selected areas of the world (Africa, the Americas, Asia and the Pacific) placing each in a past, present and future perspective. The overall approach is anthropological, that is, a major concern with people and the way they go about living.

Greenfield - Monday

Mr. Ciski

367/667CE CULTURES OF AFRICA

A broad introduction to the ecological, historical, and political dimensions of the African continent prefaces discussion of eight representative African societies, compared so as to illustrate fundamental anthropological concepts and problems. Finally, these societies are examined in their wider contexts of being part of nation-states. Problems of tribalism and national unity are stressed (e.g., the Nigerian civil war) as well as those of colonialism and neo-colonialism.

Amherst - Wednesday

Mr. Faulkingham

PARENTS NEWSLETTER

UNIVERSITY OF MASSACHUSETTS
FOR PARENTS AND FRIENDS OF THE UNIVERSITY
AMHERST - BOSTON - WORCESTER

VOL. LXII, NO. 6⁹

UNIVERSITY OF MASSACHUSETTS BULLETIN

SEPTEMBER 1970

Fall Semester Begins With Talks

The beginning of this new academic year meant the usual freshmen and opening convocations for the University community, but this time the speeches were given by the first Chancellor of the Amherst campus, Dr. Oswald Tippo.

Chancellor Tippo spoke to freshmen Sept. 8, reminding them of the atmosphere at a university and of their responsibilities therein. To the entire campus community a week later he talked about freedom of speech on campus, bomb threats, the relation of faculty to students, ecology, and other campus issues.

Here are excerpts from those speeches.

To the freshmen:

"I ask you to think for yourself, to get the facts. Don't believe in rumors and gossip. Don't follow the crowd. Don't stampede. You should examine all ideas and propositions critically, adopt the 'I'm from Missouri' skepticism. Be tough-minded. Make 'em prove it.

"And may I remind you of a few other responsibilities. You are one of 3,600 fortunate enough to be chosen from 18,000 admission applicants. Many did not make it, and of these many would give their eyeteeth to have been selected. Naturally they are critical of those who made it, especially of those who abuse their opportunities.

"Some who were not chosen had to go to Vietnam. Some who were not chosen could not come because they are so impoverished they could not afford to come. Some who were not chosen were educationally disadvantaged and they could not qualify. All this places a special obligation on you to use your time and your opportunity effectively; if not, clearly you should leave and give someone else the chance.

"You owe an obligation to your parents who contribute one thousand, two thousand, or more dollars. You owe an obligation to the State of Massachusetts which appropriates annually at least two thousand dollars for every student on the campus, in addition to building costs."

To the University community:

Free Speech

"... Universities have fought for centuries to acquire, to protect, and to foster freedom of speech. We cannot give

up this right . . . We intend to follow the recommendations of this Committee (the Faculty Senate Emergency Advisory Committee which last year reviewed the incident where a minority did not permit Hubert H. Humphrey to speak) in dealing with similar episodes: first, warning by responsible University administrators of violations; second, prompt disciplinary action; and third, provision for opposition speakers."

Bomb Threats

"... I think it ought to be recognized universally that any perpetrator of this kind of thing is committing not only a civil crime but a crime against the University, against the whole community. We must all unite against this criminal act. There are severe civil penalties. Such perpetrators must be separated from the University."

Faculty — Students

"I think also we must all rearrange our academic priorities so that we may increase our informal contacts with students in residential colleges, dormitories, lounges, coffee shops, at home — wherever good conversation is promoted. I ask that every faculty member see to it that this year he come to know well at least 15 students. After all, we do have a 15 to 1 student-faculty ratio.

"Let us give real human meaning and significance to this ratio."

Ecology

"A good deal has been said and written about ecology. I am inclined to say at this point that ecology, like charity, begins at home. In addition to enunciating lofty principles and in addition to criticizing the actions of other groups and other people, let us practice good ecology on this campus by not littering papers, beer cans and other refuse; by placing signs, posters, and notices on bulletin boards; by respecting lawns, flowerbeds and shrubbery; and by not adding to the pollution of the campus pond."

A University

"I now turn to consideration of the central purposes of the university, learning and teaching. We must give greater empha-

sis to our responsibilities of teaching. The students demand it, taxpayers and legislators demand it, and the logic of the times demands it. We must put our house in order lest we have imposed on us from outside severe, rigid and educationally sound restrictions."

Outside Help

"I hope I never live to see the day that outside help will be needed. I can assure you before that last unfortunate step is taken, we will have the widest kind of consultation with student leaders, the Faculty Senate Emergency Committee which has been set up specifically for this purpose, and appropriate administrators. But it may become necessary. Surely any thinking person must realize that if we do not take action in a case of a serious disturbance, the matter will be taken out of our hands. This may lead to tragedy as it has on other campuses."

Job Interviews

"Our policy is to provide the opportunity for any student who wishes voluntarily — no one is forced — to have interviews with industrial, school and governmental representatives. I must admit we had some lapses in this policy last year. We cannot permit these to be repeated."

Takeovers

"... if we have any more building takeovers, if we have any interference with free speech and free movement including attendance to class, if we have continued defacing of buildings and damage to buildings, if we continue to have strikes and other interruption of academic work, if we do not keep this campus open for those who come here for the serious purpose of study and teaching, it is my judgement that we will be subject to repressive legislation and budget cuts and even warnings of complete withdrawal of state funds.

"Certainly you have to be a moron to think that taxpayers of this state will long continue to appropriate large sums of money — money desperately needed for other purposes, if the University does not stay open to provide the education for which the money was appropriated."

This Professor Is President Wood

Among faculty members new to the University's Amherst campus this year is one assigned to teach National Urban Policy to 40 students each Tuesday afternoon. He's a soft-spoken 47-year-old man with thinning blond hair, glasses, and the title of President of the University of Massachusetts.

But President Robert C. Wood tries to keep his title out of the classroom. "I told the students," he explains, "that in the classroom I was a professor, and that they should not necessarily expect me to say the same things as President."

Dr. Wood, the professor, plans to teach a course each semester at either the Boston or Amherst campus, and eventually perhaps at Worcester.

He enjoys teaching, as he enjoys other personal contact with people. He considers conversation one of his hobbies, and feels, "Good conversation is hard to come by." Breakfast time at the Wood household in Lincoln is also sit down and talk time for Frances, 15; Margaret, 12; Frank 10; Mrs. Wood (Peg), and the head of the household.

Dad is interested in what they are interested in — like Frank's Little League playing, Maggie's boarding her horse, and Mother's weekly broadcasting. (Peggy Wood is co-hostess with Margot Lindsay on WBZ Radio's "A Closer Look" on which they discuss various topics with guests Sunday nights from 11:05 to 11:30 on AM radio and Saturday noon on FM).

Mr. and Mrs. Wood share some hobbies, but there's a limit. Both play tennis, but he admits to being "a little awkward at it." Both sail, but he calls her "an active sailor." Mrs. Wood also skis, but Mr. Wood tried it just once. He almost shudders when he recalls that day in Aspen, Colorado. He, in his aging late 30s, sliding down a hill and breaking his leg, and the 18-year-old ski instructor insisting he go back up the hill to conquer any fears he might have. That ended his skiing career. Perhaps he never trusted snow anyway, this Florida native who never saw the stuff until he was 17. For exercise now he often steps outside for a few moments of woodsplitting.

Peggy and Bob met in Washington, D.C., while she was attending a YMCA-YWCA seminar and he was working for the Bureau of the Budget. "It was a summer romance," he says, and later she transferred from Radcliffe College in Cambridge to George Washington University in D.C. "because I knew if she stayed at Radcliffe she'd marry a Harvard man." He was a Princeton man and then a Harvard graduate student before going to work for the Florida state legislature and then on to The Bureau of the Budget.

Tallahassee was a bit much for bachelor Bob Wood. The town, then with a popula-

tion of about 25,000, he explains, had three movie theaters. "Every time you took a girl out, everyone knew it — so I fled north" to Washington and the administrations of Truman and Eisenhower. A good move. He met the future Mrs. Wood and improved his knowledge of housing and urban development, and crime and corruption. "The Budget Bureau is a superb place for a young person who wants to see the country's government from the top — the world's best post-graduate course in political science," he says.

Wood eventually became Secretary of the U.S. Department of Housing and Urban Development, M.I.T. professor of political science and chairman of the department, director of the Joint Center for Urban Studies at M.I.T. and Harvard, a member of President Kennedy's Task Force on Housing, and chairman of President Johnson's two task forces on urban problems.

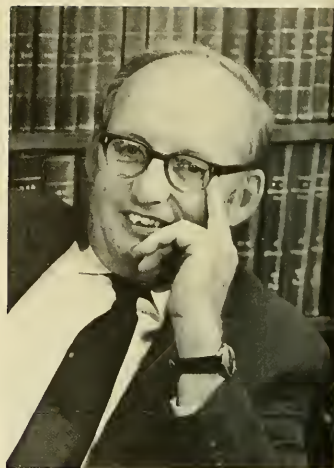
For the past few weeks the new President has been meeting students, alumni, faculty members, and others involved with the Amherst campus. Many who've met him are surprised he later remembers them, and pauses to chat. President Wood shakes hands firmly but not too strongly. He smiles gradually. He looks at you, momentarily excluding others in the area. It's a warm greeting during which he fixes you in his mind. You, perhaps, but not necessarily your name. "My capacity to remember names is not one of my great assets," he says. And if you look quickly, you may see a smile as he says this, a smile so slight you can't be sure.

If you sit together to talk, he pulls out a bracelet-length string of Greek worry beads, and as he fingers them you are mildly conscious of beads clicking against each other. He picked them up in Greece a year ago during a ship-traveling meeting of urbanists. (There's that slight smile again as he talks about the urbanists who "visited the islands and worried about cities.") Dr. Wood gave up smoking in 1967, and says handling those beads is "a lot better than chewing gum or eating candy."

He's a cup after cup coffee drinker, and will have a dietetic liquid lunch if one is available.

He'll tell you he watches television very little, restricting himself to news, sports, and "Laugh-In." And he hopes eventually to be watching a different kind of television in relation to his new position — a telecommunications system to tie-in the University's three campuses.

The new President sees the three campuses as autonomous entities academically, but related in terms of policy, goals, and overall organization and management. "I'm anxious to let each campus strengthen and supplement the other," he says, adding he has "no compulsion toward uniformity." For each campus to have its own style,



they must not be a "cookie-cuttered set," he says.

In directing these stylized campuses, Dr. Wood expects not to be bogged down with bureaucracy. "I try to know as little as possible about the bureaucracies I don't have to deal with." As Secretary of the U.S. Department of Housing and Urban Development, with its 15,000 employees, Dr. Wood "concentrated on the most important, or new problems, the flexible; and ignored the non-problems."

As University President, one of his problems is apt to be student unrest, the causes for which he divides into categories of "immediate" and "latent." Under "immediate causes" he includes the unpopular war, unfair draft, political conditions, and race issues. And in the other category he lists "more fundamental" causes.

Today's college generation, he believes, has had "no unifying theme" such as World War II or the Depression, so suffers a "lack of commonality" and therefore "needs a cause or a commitment." Television has opened up the world, he notes, and because society demands its people have more knowledge, "the process of being a student goes on longer and longer." The generation has greater expectations, and because its members never knew depression for themselves, they challenge "our used ledger."

There is also, Dr. Wood adds, that "good American tradition of wanting to do something better than your old man" — a tradition toward which today's youth is especially driven, partly by modern circumstance and partly by convictions stronger than the old man's.

The parents' generation remembers when the issue of race was "not school desegregation but lynching," Dr. Wood notes. And, the student generation grew up hearing of

(Continued on Page 3)

Campus Center Tours Begin

Overnight accommodations await parents at the new Campus Center, as do daily tours of the 11-story building adjacent to the Student Union.

There are 116 hotel rooms to serve 220 people at the Murray D. Lincoln Campus Center, and rooms may be reserved by students for their parents, or by a telephone call to (413) 549-6000. Single rooms are \$14 and double rooms are \$18. Reservations not accompanied by a \$10 deposit will be kept until 6 p.m. on expected date of arrival, though a telephone call will hold the room later, according to Donald E. Witkoski, accommodations manager.

Since the Campus Center is conveniently located on the University campus, parking is no problem — there is a 900-car garage adjacent to the building. Breakfast and a quick snack may be had at the coffee shop on the second level of the building, and full course lunches and dinners are available in the 550-seat cafeteria, also on the second level. By mid-October, the Top of the Campus Restaurant on the 11th floor will begin serving a la carte meals.

Tours of the building may be arranged by contacting — in advance, please — the

Information Center on the second level, 545-0012. Staff members and volunteer students will be your guides.

About 70 per cent of the Campus Center is completed, and the other 30 per cent is expected to be completed by November 1. Finishing touches will include adorning the now-bare interior concrete walls with art works to improve acoustics and create a warmer atmosphere.

Costs of the Campus Center Project are expected to reach approximately \$20.5 million, including \$15 million for the Center, \$4.5 million for the garage and loading-delivery area, and \$1 million for the remaining debt service of the Student Union building. Yearly costs are expected to be about \$2.2 million.

Income will be from several sources: student fees (which were increased from \$30 last year to \$48 this year for undergraduates), room rents, bookstore, food service, conferences, garage rental, and reserves from student fees of previous years. The service areas, including the bookstore, restaurants, and hotel, are expected to pay for themselves and to con-

tribute to the debt service. No student fees will go toward the garage which will use its own parking fees for amortization.

Almost half the total debt and operations expense will be paid from non-student fee income. Most space in the Campus Center is for both students and conferees — the restaurants, meeting rooms, ballroom, and bookstore, for example. Some areas, such as the overnight rooms, will probably be used primarily by conferees — though they are available for parents and guests of students.

The Campus Center Governing Board, which makes policy for the building, includes three students from each of the four undergraduate classes, three students named by the Graduate Student Senate, a representative of the Stockbridge School Senate, a representative of the undergraduate Student Senate, a representative of the faculty, a representative of the Associate Alumni, and three officers from last year's Student Union Governing Board.

A Program Council of the Board is composed of students who choose music, art, dance, film, and other events for the Center.

President

(Continued from Page 2)

such as the 1954 Supreme Court school desegregation order which has still not been met. "Different perspectives," he says quietly.

He labels "important" the two-week pre-election recess proposed for the Amherst campus this fall, but says the fixed dates suggested were "unimportant." The idea was "important," he feels, because it "acknowledged the citizenship students have." The University's adopted compromise plan, which makes student pre-election work voluntary and does not suspend classes, is "just as effective without penalizing the apathetic," the President says. He adds, "Everyone has the right to ignore politics."

In a speech he once said, "We must never practice politics on the University for the sake of politics or practice." He sees a university as a prototype for society, but not as a cure-all. "A university cannot substitute for the malfunctionings of society; it can help, but its basic function is that of learning." A university, he explained, should know, for example, how to provide housing for the poor, but other parts of society should take that knowledge and do something with it.

Robert S. Wood, 17th President of the University of Massachusetts. Having left three jobs (with M.I.T., the Joint Center for Urban Studies, and the Massachusetts Bay Transportation Authority) for one, he feels his life "has become focused again."

Four Redmen Games Left

Four games remain in the Redmen's 1970 football season. UMass will play at home with New Hampshire Nov. 14 and with Boston College Nov. 21. Away games will be with Vermont Oct. 31 and with Holy Cross Nov. 7.

Information and tickets may be obtained by calling the Ticket Office at (413) 545-0810 or writing: Walter P. Novak, Ticket Office, Boyden Building, University of Massachusetts, Amherst, Massachusetts 01002.



Many seats available in Boyden Gymnasium registration day, but these students were more comfortable working together on the floor.

Enrollment Up

Undergraduate enrollment is up 915 students this semester, 15,365 students compared to last year's 14,450 students on the University's Amherst campus. These figures refer to the number of students taking courses, but do not point out how many of that number are full-time students.

Adjusting the figures to come up with the number of full-time equivalent undergraduates, we get an increase of 936 students this year — 14,326 last year and 15,262 this year.

Stockbridge School of Agriculture has 633 students enrolled this semester. This is a decrease of three students since last year. Stockbridge expects to keep its enrollment constant at about 625, and the full-time equivalent student figures show 625 for fall, 1969 and 620 for fall, 1970.

'Collegian' Subscriptions

Subscriptions for the student newspaper, "The Massachusetts Daily Collegian," are available for \$14 a year or \$7.50 a semester. The "Collegian" prints five times a week, except during exam and holiday periods. Checks should be mailed to:

"The Massachusetts Daily Collegian"
Student Union Building
University of Massachusetts
Amherst, Mass. 01002

Published eleven times a year by the University of Massachusetts in February, March(3), June, August, September, November(2) and December(2). Second class mail privileges authorized at Amherst, Massachusetts 01002, and at additional mailing offices.

Housing Situation Easing

Two weeks after this semester began there were about 100 fewer triple rooms in student residence halls. The total was down 350 to 251.

Housing office officials attributed the decrease to these factors: some students did not return to the University, some took off-campus housing, and some filled vacancies in co-ed residences.

Of the remaining triples, 194 are in Southwest Residence Area, and 57 are in Central-Northeast. With a few exceptions, tripling has been limited to freshmen and sophomore men.

Of the three residence halls under construction in the Northeast corner of cam-

pus, one is expected to be ready prior to the start of second semester. Students who live in a triple room for six weeks or longer will each receive a 30 per cent rebate on room rent and telephone, if in their residence halls there are no vacancies which would allow for detripling. Overcrowding is expected to be alleviated once the new suite-type dormitory is completed. Students requesting this type of accommodations last spring will be given priority.

A labor dispute delayed completion of the three residences. The Housing Office coped with the overcrowding by asking students to volunteer for triples, encouraging commuting, implementing a room rent deposit, and publicizing available spaces in fraternities and sororities.



New campus police officers — Women, left to right: Miss Lona Jackson, Mrs. Mary Dumas, and Mrs. Phyllis George. Men, left to right: Lawrence Holmes, Thomas Quinlan, Richard Grader, James Tucker, Robert Hawkins, William Slys, and Stephen Warren. The 10 were chosen from 182 applicants from throughout the state. Five were University employees promoted from other positions, and five came from outside the University.

UNIVERSITY OF MASSACHUSETTS BULLETIN
AMHERST, MASSACHUSETTS 01002

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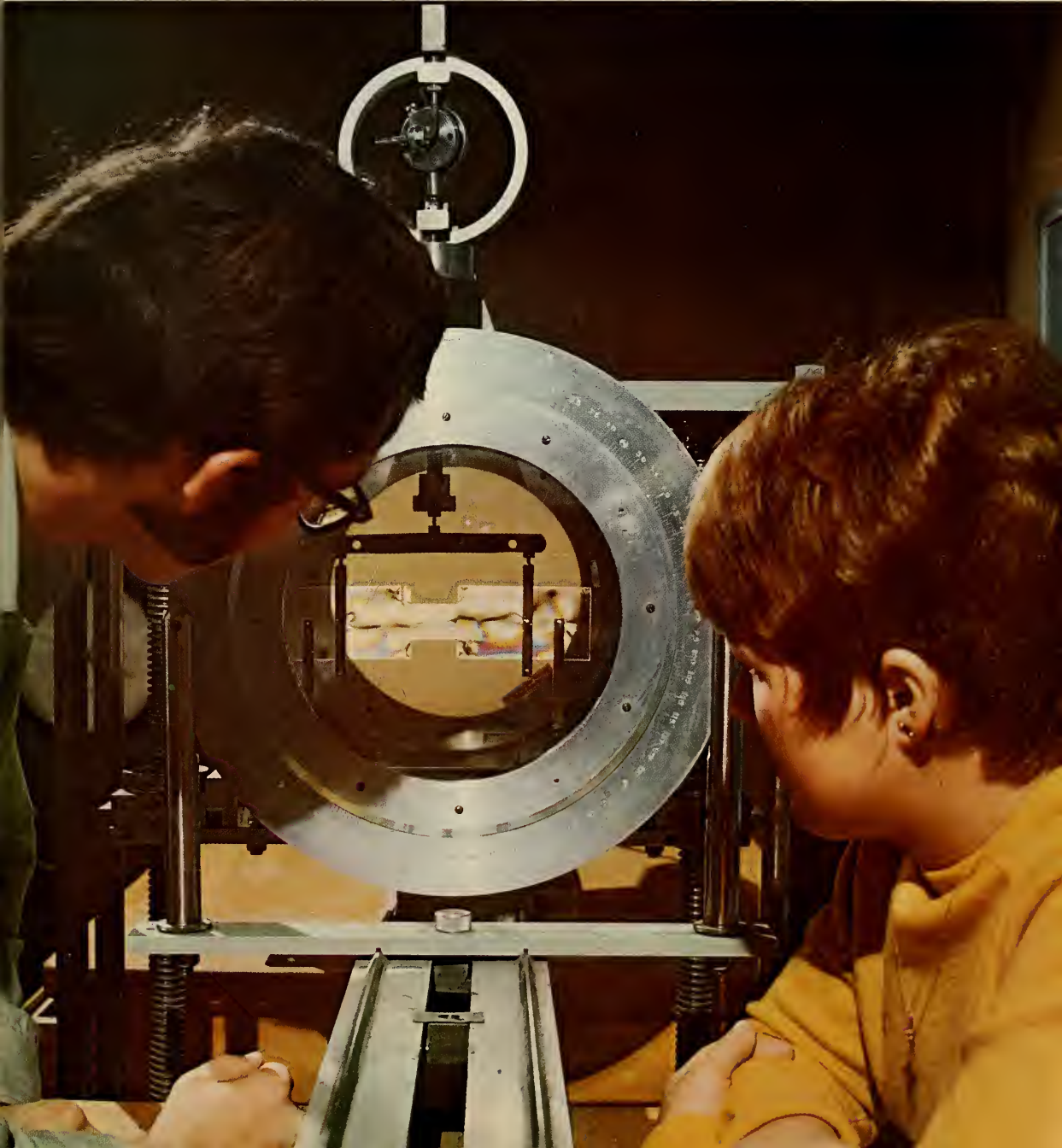
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PARENTS NEWSLETTER
FOR PARENTS AND FRIENDS
OF THE UNIVERSITY

1971-1972

UNIVERSITY OF MASSACHUSETTS BULLETIN
GRADUATE SCHOOL



VOLUME LXII

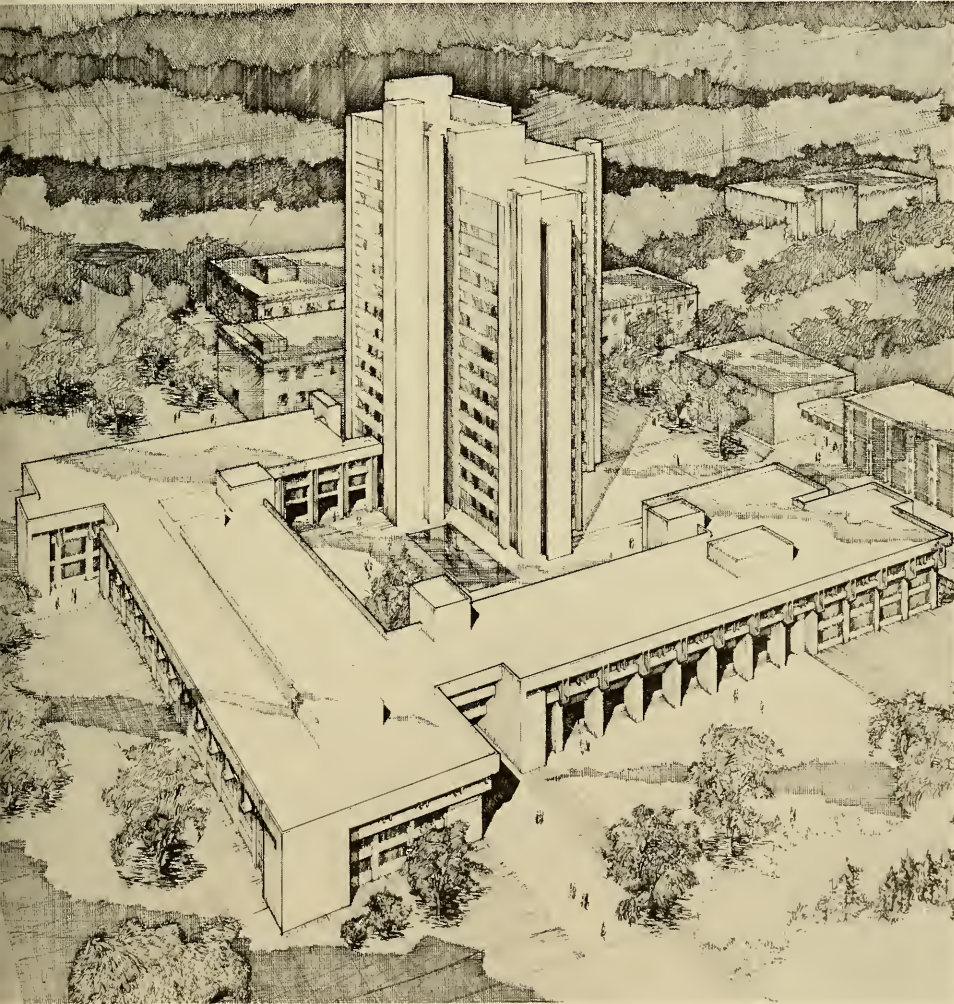
NOVEMBER 1970

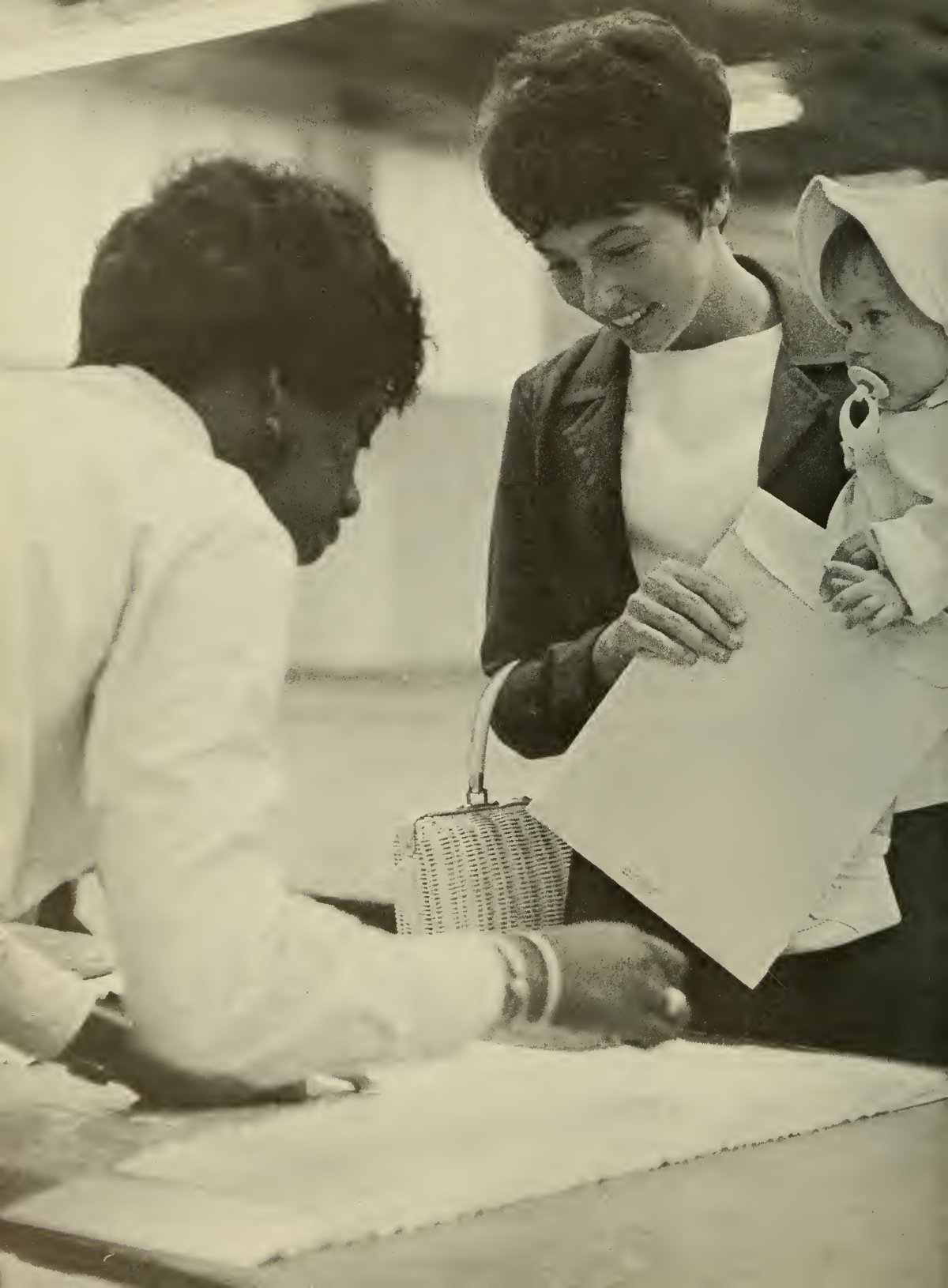
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University of Massachusetts at Amherst

1971-1972 Graduate School Bulletin





Contents

ACADEMIC CALENDAR	4
TRUSTEES OF THE UNIVERSITY	7
ADMINISTRATIVE OFFICERS	8
GENERAL INFORMATION	11
The University	11
Admission	18
Application Procedures for Admission and Readmission	19
Tuition and Fees	21
Housing	25
Assistantships and Fellowships	27
Programs Offered	29
Requirements for Doctoral Degrees	31
Doctoral Dissertation	35
Requirements for Master's Degrees	38
Master's Thesis	42
Graduate Reading Examination in Foreign Languages	43
General Regulations	44
Special Services Available to Graduate Students	47
DESCRIPTION OF COURSES	49
INDEX	300

1970-71 Academic Calendar

Tuesday, September 8	Registration for graduate students
Friday, September 11	Classes begin
Friday, September 25	Last day to add courses
Monday, October 12	Last day on which 1971 Ph.D. and Ed.D. candidates may take the preliminary comprehensive examinations
Monday, October 12	Holiday
Friday, October 23	Last day to drop courses
Saturday, October 24	Graduate Foreign Language Tests
Wednesday, November 11	Holiday
Wednesday, November 25	Thanksgiving Recess begins after last class
Monday, November 30	Thanksgiving Recess ends, 8:00 a.m.
Monday, November 30	Counseling Period begins for students in residence
Friday, December 4	Counseling Period ends
Saturday, December 12	Graduate Foreign Language Tests
Wednesday, December 23	Christmas Recess begins after last class
Monday, January 4	Christmas Recess ends, 8:00 a.m.
Wednesday, January 6	Final examinations begin
Friday, January 15	Final examinations end
Monday, January 18	Last day on which June 1971 Master's degree candidates may submit approved thesis outlines
Tuesday, January 26	Registration for graduate students
Friday, January 29	Classes begin
Tuesday, February 9	Last day to add courses
Saturday, February 13	Graduate Foreign Language Tests
Monday, February 15	Holiday
Tuesday, March 16	Last day to drop courses
Saturday, March 20	Spring Recess begins after last class
Monday, March 29	Spring Recess ends, 8:00 a.m.
Friday, April 16	Last day on which September 1971 Master's candidates may submit approved thesis outlines
Monday, April 19	Holiday
Saturday, April 24	Graduate Foreign Language Tests
Thursday, May 3	Counseling Period begins for students in residence
Friday, May 7	Counseling Period ends
Monday, May 17	Last day of classes
Thursday, May 20	Final examinations begin
Monday, May 24	Holiday
Saturday, May 29	Final examinations end
Sunday, May 30	Commencement
Saturday, June 19	Graduate Foreign Language Tests
Friday, August 20	Last day on which January 1972 Master's candidates may submit approved thesis outlines

1971-72 Academic Calendar

Tuesday, September 7	Registration for graduate students
Friday, September 10	Classes begin
Friday, September 24	Last day to add courses
Monday, October 11	Last day on which June 1972 Ph.D. and Ed.D. candidates may take the preliminary comprehensive examinations
Monday, October 11	Holiday
Friday, October 22	Last day to drop courses
Saturday, October 23	Graduate Foreign Language Tests
Monday, October 25	Holiday
Wednesday, November 24	Thanksgiving Recess begins after last class
Monday, November 29	Thanksgiving Recess ends, 8:00 a.m.
Monday, November 29	Counseling Period begins for students in residence (classes <i>not</i> suspended)
Friday, December 3	Counseling Period ends
Saturday, December 11	Graduate Foreign Language Tests
Wednesday, December 22	Christmas Recess begins after last class
Monday, January 3	Christmas Recess ends, 8:00 a.m.
Wednesday, January 5	Final examinations begin
Friday, January 14	Final examinations end
Saturday, January 15	Graduate Foreign Language Tests
Monday, January 17	Last day on which June 1972 Master's degree candidates may submit approved thesis outlines
Friday, January 21	Registration for graduate students
Wednesday, January 26	Classes begin
Wednesday, February 9	Last day to add courses
Saturday, February 12	Graduate Foreign Language Tests
Monday, February 21	Holiday
Friday, March 3	Last day to drop courses
Saturday, March 25	Spring Recess begins after last class
Monday, April 3	Spring Recess ends, 8:00 a.m.
Friday, April 14	Last day on which September 1972 Master's degree candidates may submit approved thesis outlines
Monday, April 17	Holiday
Saturday, April 22	Graduate Foreign Language Tests
Monday, May 1	Counseling Period begins for students in residence (classes <i>not</i> suspended)
Friday, May 5	Counseling Period ends
Friday, May 12	Last day of classes
Tuesday, May 16	Final examinations begin
Thursday, May 25	Final examinations end
Saturday, May 27	Commencement
Saturday, June 17	Graduate Foreign Language Tests
Friday, August 18	Last day on which January 1973 Master's degree candidates may submit approved thesis outlines



Trustees of the University

Organization of 1970

Term expires

JOSEPH P. HEALEY <i>of Arlington</i>	1977
FRANK L. BOYDEN <i>of Deerfield</i>	1974
ROBERT M. ABRAMS <i>of Holyoke</i>	1977
EDMUND J. CROCE <i>of Worcester</i>	1977
DENNIS M. CROWLEY <i>of Boston</i>	1973
GLENN M. ELTERS '71 <i>of Amherst</i>	1971
ROBERT P. GORDON <i>of Lincoln</i>	1971
JOHN W. HAIGIS, JR. <i>of Greenfield</i>	1975
MRS. ELIOT S. KNOWLES <i>of South Dartmouth</i>	1975
LORENZO D. LAMBSON <i>of Southwick</i>	1973
LOUIS M. LYONS <i>of Cambridge</i>	1971
JOHN J. MAGINNIS <i>of Worcester</i>	1972
GEORGE L. PUMPHRET <i>of Dorchester</i>	1974
MRS. GEORGE R. ROWLAND <i>of Osterville</i>	1972
ALAN SHALER <i>of Easthampton</i>	1977
MRS. O. PHILLIP SNOWDEN <i>of Roxbury</i>	1976
FREDERICK S. TROY <i>of Boston</i>	1977
CHRISTOPHER J. WELDON <i>of Springfield</i>	1976

Ex Officio

FRANCIS W. SARGENT <i>of Dover, Governor of the Commonwealth</i>
ROBERT C. WOOD <i>of Lincoln, President of the University</i>
NATHAN CHANDLER <i>of Sterling Junction, Commissioner of Agriculture</i>
ALFRED L. FRECHETTE, M.D. <i>of Brookline, Commissioner of Public Health</i>
MILTON GREENBLATT, M.D. <i>of Newton, Commissioner of Mental Health</i>
NEIL V. SULLIVAN <i>of Cambridge, Commissioner of Education</i>
NORMAN G. MACLEOD <i>of Amherst, Chairman, Board of Selectmen</i>

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FRANK L. BOYDEN <i>of Deerfield, Honorary Chairman</i>
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KENNETH W. JOHNSON <i>of Amherst, Treasurer</i>



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Secretary to the Board of Trustees

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Dean of the Graduate School

ARTHUR C. GENTILE, Ph.D.
*Associate Dean of the Graduate School
and Acting Coordinator of Research*

KARL W. BROEKHUIZEN, M.B.A.
Business Manager of the Graduate School

University of Massachusetts/Amherst

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Dean of the School of Physical Education

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Head of the Department of Public Health

University of Massachusetts/Boston

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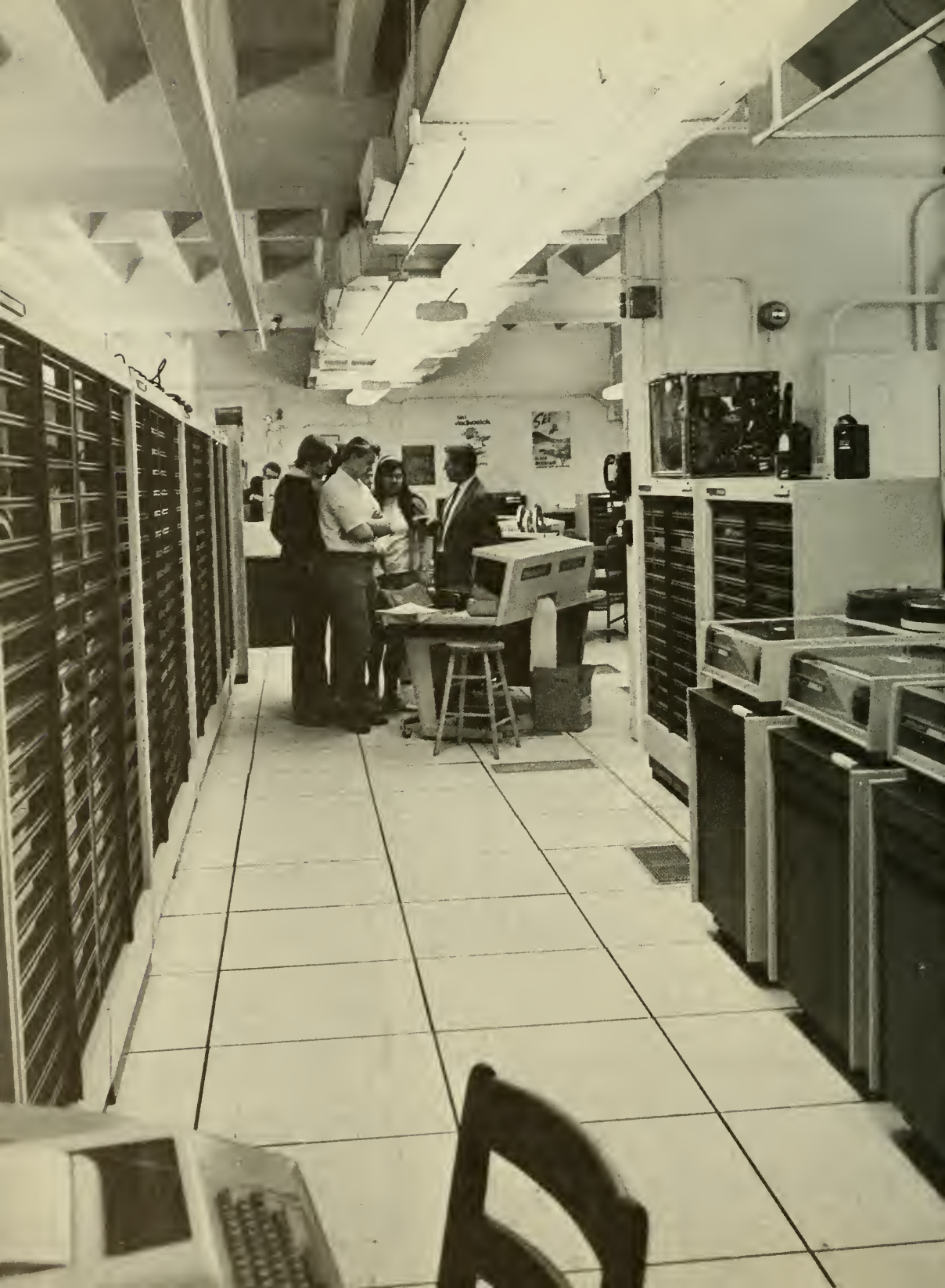
Chancellor

University of Massachusetts/Worcester

LAMAR R. SOUTTER, M.D.

Dean of the Medical School

UNIVERSITY OF MASSACHUSETTS



General Information

The University

The University of Massachusetts is the state university of the Commonwealth. It was founded in 1863 under the provisions of the Morrill Land Grant Act passed by the United States Congress one year earlier.

Situated in one of the most picturesque sections of the state, the University at Amherst joins with its academic neighbors—Amherst, Smith, and Mount Holyoke Colleges and newly founded Hampshire College—in maintaining the rich tradition of education and cultural activity associated with this Connecticut Valley region. The University's central campus consists of approximately 1,100 acres of land and 110 buildings. Physical growth has been carefully planned, with provisions for additional buildings and facilities to accommodate an enrollment of approximately 25,000 students by 1975.

The Dean of the Graduate School in collaboration with the University Graduate Council exercises overall review and supervision of graduate programs conducted in the several colleges and provides guidance in the development of new programs as well as the maintenance of standards for existing programs. Each college of the University has developed its graduate programs in accord with the highest national professional standards of the respective fields.

COLLEGES CONDUCTING GRADUATE PROGRAMS

Eight colleges and schools of the University and one unaffiliated department are authorized to offer graduate degrees through the Graduate School: *College of Agriculture*; *College of Arts and Sciences*; *School of Business Administration*; *School of Education*; *School of Engineering*; *School of Home Economics*; *School of Nursing*; *School of Physical Education*; and *Department of Public Health*.

UNIVERSITY LIBRARY

The University Library system is composed of the central building, Goodell Library, and a number of departmental collections. Present holdings include about 900,000 books, periodical volumes, and government documents, and over 100,000 microforms. A central card catalog lists under author, title, and subject all books to be found in Goodell and the departmental libraries.

The Library has collections in all fields in which degrees are offered. Since 1965 the Library has had a policy of purchasing "All Books Current" in the major Western languages, which assures acquisition of all university-level books currently being published or reprinted. More than 8,000 literary, scientific, scholarly, and popular periodical titles are received.

Goodell Library contains the major portion of the collection, including the reference collection, special collections of rare books and manuscripts, Univer-

sity archives, maps, and microforms (microfilms, microfiche, microprint, and microcards). The Library is a depository for U. S. Government publications. The Library also receives regularly many categories of publications of the United Nations and other international agencies and of the Commonwealth, cities, and towns of Massachusetts. Periodicals are housed in Goodell or the departmental libraries, according to their subject matter. Holdings and locations are listed in both the card catalog and the *Four College Libraries Union List of Journal and Serial Holdings*, a computer-produced book that is brought up to date annually and includes also the serials of Amherst, Smith, and Mount Holyoke Colleges and the Hampshire Inter-Library Center.

Construction of a new 28-story library, designed by Edward Durell Stone, is expected to be completed during 1971. The building will house 2¼ million volumes, departmental seminar rooms adjacent to the appropriate parts of the collection, and seating for 3000, including 600 individual studies for faculty members and graduate students.

HAMPSHIRE INTER-LIBRARY CENTER

The University Library is a participating member of the Hampshire Inter-Library Center, a cooperative facility for the acquisition, storage and servicing of research materials, especially journals, documents and scholarly sets. Incorporated in 1951 to augment library resources in the area, HILC is jointly operated by the libraries of the five Connecticut Valley colleges—Amherst, Hampshire, Mount Holyoke, Smith, and the University of Massachusetts—and the Forbes Library of Northampton, Massachusetts. The collection numbers more than 33,000 bound volumes; approximately 900 journals are received currently. The center is located on the second level of Goodell Library.

THE UNIVERSITY COMPUTING CENTER

The University Computing Center provides the computing services needed by the faculty and students of the University in their instructional and research activities. The Center currently operates with a system made up of two CDC 3600 computers with a wide variety of peripheral devices including drums, disks, tape drives, card readers, card punch and line printers. Off line equipment includes plotters, verifiers, collator, sorter, keypunches, etc.

Computing services include both batch operation and time-sharing. The batch operation supports most popular programming languages as well as a large library. Time-sharing supports 64 simultaneous users from terminals distributed about the campus. The main languages offered are FORTRAN, BASIC, and APL. A number of special-purpose languages are also included in the system.

In addition to the computing services, the University Computing Center offers many user services, including application programming, consulting, library, program assistance, and keypunching. Short courses in programming and various languages and use of various systems are offered as needed by the community. Formal full-term courses in computing techniques are offered by the Computer Science Program.



Use of the computing facilities is open to all students for work in conjunction with their courses or research. Application is made at the main office of the University Computing Center.

Several graduate assistantships and jobs for students, both graduate and undergraduate, are available. Prior knowledge of computer operations and programming is usually required. Inquiries may be addressed to the Director, University Computing Center, Engineering Laboratory Building, University of Massachusetts, Amherst, Massachusetts 01002.

LABOR RELATIONS AND RESEARCH CENTER

The Labor Relations and Research Center was founded to carry on research in the labor field, to develop continuing education and consultation services, and to support a program of academic course work. An M.S. in Labor Studies is described elsewhere in this Bulletin. Inquiries should be addressed to the Director of the Labor Relations and Research Center, Draper Hall, University of Massachusetts, Amherst, Massachusetts 01002.

WATER RESOURCES RESEARCH CENTER

The Water Resources Research Center at the University's Amherst campus supports research in planning and development of water and related land resources including: engineering; economics; hydrogeology; management and decision-making institutions; and ecology of wetlands, rivers, lakes and coastal waters. Through this research the Center provides training opportunities for candidates for the master's and doctoral degrees in water resource-related fields. The Center assists the University departments in the development of new and strengthened water resources programs and courses.



THE MARINE STATION

The University of Massachusetts Marine Station is located at Hodgkins Cove on the North Shore of Cape Ann, just beyond Annisquam in the city of Gloucester. It consists of approximately seven acres of land with a wooden pier some 120 feet long having a landing on the west side. The pier can accommodate ocean-going ships drawing 18 feet of water, which is an adequate capability for the marine programs. On the site is a newly renovated, well-equipped laboratory building which contains approximately 3200 square feet of space. The University plans to expand its laboratory, office, and classroom facilities at this site over the next few years.

The city of Gloucester is an ideal location for this station as it is central to the North Shore environment and is an important commercial port. Gloucester is also the home of the Bureau of Commercial Fisheries, which has well-equipped laboratories, shops, and a library. The Bureau has indicated its willingness to cooperate with the University in its marine activities at Gloucester.

DEPARTMENTS OF MILITARY AND AIR SCIENCE

Seniors and graduate students with two years of academic study remaining who are interested in becoming commissioned officers in the United States Army or United States Air Force may apply to the Department of Military or Air Science for their two-year commissioning program. Selected students receive \$50 per month and are granted Selective Service deferments.

Those interested may consult the professor of either department at least seven months prior to the beginning of their final two years at the University. Early application is necessary for administrative processing, an aptitude test, a physical examination, and attendance at a six-week summer camp.

FREIBURG PROGRAM

The Freiburg Program, launched in 1966-67, offers the opportunity for a year of advanced study in the humanities, social sciences and arts at the University of Freiburg, Germany, to graduate students and selected upper division undergraduates. Although a good command of German is necessary for admission, the program is not restricted to students concentrating in German language and literature. A superior academic record is required for admission. Accepted students may enroll in a wide variety of courses at the University of Freiburg, including political science, comparative literature, philosophy, economics, music, and German language and literature.

The program is directed in Freiburg by a member of the University of Massachusetts faculty. Two other University of Massachusetts faculty also participate in the program annually, one each in the fall and spring semesters, teaching at the University of Freiburg as visiting professors of that institution. Linked with the Freiburg Program is the program of Field Studies in Anthropology of the Anthropology Department of the University of Massachusetts. Both programs are headquartered in the University of Massachusetts Study Center in Freiburg. The relationship between the two universities is developing into a genuine partnership, with students and faculty from each institution going to the other to study and teach.

Students from other colleges and universities are eligible to apply for admission to the Freiburg Program. Undergraduates apply through the University's Office of International Programs, Whitmore Administration Building, Amherst. Students from other colleges and universities applying to study in the Freiburg Program at the graduate level must apply for admission to the Graduate School of the University of Massachusetts as well as to the International Programs Office.

Basic cost of the program is estimated at about \$2,300, including international travel, room and board, tuition and fees. Scholarships are available to outstanding students and Fulbright scholarships may be applied to participation in the Freiburg Program. Applications and additional information are available at the Office of International Programs.

FREIBURG SUMMER PROGRAM

The Department of Germanic Languages and Literatures sponsors a six-week summer program in Freiburg, Germany. Courses in elementary, intermediate, and advanced German are offered, and students may earn up to six University of Massachusetts credits. There is a three-week period for independent travel in Europe before the academic program begins.

The course fee for the program is \$800 (\$830 for non-residents of Massachusetts). This covers round-trip international travel, tuition, room and board, special excursions, and lectures which supplement the basic program.

Although primarily for undergraduates, the program is open to graduate students as well. One of its aims is to offer to students enrolling in the Freiburg year

program the opportunity to gain greater proficiency in German before they participate in the year program.

For further information contact the Department of Germanic Languages and Literatures, Herter Hall.

BOLOGNA SUMMER PROGRAM

The Bologna Summer Program, held from late June to the end of August, offers courses at the undergraduate and graduate levels in the history, literature, art, and music of Baroque and modern Italy. Knowledge of Italian is not a prerequisite; the language is offered as part of the curriculum. Field trips to major cultural centers in Italy are an integral part of the program. The program, staffed primarily by members of the faculty of the University, is open to students from other colleges and universities as well as University of Massachusetts students. Enrollment is about 60 students. Any student in good academic standing is eligible to apply to the program. The cost of tuition, housing and international travel is \$725. Students pay for their own meals and for their expenses during the approximately three weeks available for free travel at the end of the six-week academic program. Professor Howard Quint of the History Department is the program director.

SUMMER STUDIES IN FRENCH, PAU, FRANCE

The Department of Romance Languages sponsors French studies at both the undergraduate and graduate levels for six weeks (early July to mid-August) at Pau in southwest France. A year of college French or the equivalent is prerequisite. Students are placed in courses according to their level of ability; the program offers courses in language, stylistics, literature and civilization. The professorial staff is from the French university system, particularly from the Universities of Bordeaux and Toulouse. Up to six University of Massachusetts credits may be earned, and successful participants will receive a "certificat d'assiduité" from the University of Pau.

The Pau Program students depart from Boston in mid-June and return in late August, and have about three weeks for independent travel before the academic program begins. Enrollment in the program costs \$700; this includes international travel, tuition and books, room and board at Pau and excursions arranged by Pau University. A limited number of scholarships is available. Further information is available from: French Studies at Pau, Department of Romance Languages.

SUMMER PROGRAM OF HISPANIC STUDIES IN MADRID

In its summer program in Madrid, mid-June to mid-August, the Department of Hispanic Languages and Literature offers two graduate seminars, two courses open to graduates, seniors, and approved juniors, and one undergraduate course. They are all conducted in Spanish and carry 3 credits each. The normal load is 6 credits. The purpose of the program is: 1) to provide access (for qualified students) to intensive advanced work in literature and the history of ideas; 2)

to offer the experience of total immersion in the Spanish language and culture; 3) to introduce students to Spanish scholars and creative intellectuals and artists who have not come to the U.S. to teach. Among the distinguished faculty for 1970 were Pedro Laín Entralgo, José Monleón, José Alonso-Misol, and José Olivio Jiménez.

In addition to a six-week course of study, the program offers lectures, integrated weekend trips, and an optional post-study tour of Andalucia. Fees include round-trip air transportation, tuition, room and board in a selected private home, lectures and excursions. The cost to Massachusetts residents is \$875; to non-residents, \$905. Applicants should contact the Director, Madrid Program, 415 Herter Hall.

OXFORD SUMMER SEMINAR

A special group of courses in English literature is regularly offered at Trinity College, Oxford, during July and part of August. The six-week session is part of the regular Summer Session of the University of Massachusetts and awards University of Massachusetts credit. Courses are taught by Oxford dons and the Bodleian Library is available for extensive research. Graduate and undergraduate courses are offered and vary according to the availability of specialists at Oxford and the interests of students. Special evening lectures by noted authorities supplement the course offerings. Students from other colleges and universities are admitted. Admission requirements include 15 hours of credit in literature and good academic standing. The overall cost to the student is \$850. To apply, contact Dr. Ernest Hofer, Department of English.

FIELD COURSE IN CULTURAL ANTHROPOLOGY, ST. VINCENT, WEST INDIES

The Anthropology Department offers an eight-week field course in cultural anthropology to graduate and selected undergraduate students in anthropology. The purpose of the course is to give students a supervised introduction to cultural anthropological field work, the foundation of a professional career in anthropology. The course is given in June and July.

The first week is devoted to orientation and familiarization with the culture of St. Vincent in the capital, Kingstown. This is followed by six weeks' residence in research sites selected on the basis of both student and government interest. Research activities in the field are closely supervised by the director of the program, and students return to Kingstown periodically for brief seminars to compare and discuss their progress and problems. The final week's work, held in Kingstown, is devoted to presentation of preliminary results, evaluation, discussions with officials of Government, and planning for publication of final reports.

Costs of the program including round-trip air transportation from New York, tuition, room and board, and program-related transportation is \$500 (\$530 for non-residents of Massachusetts). Limited financial aid is available. Students earn 6 University of Massachusetts credits. Further information can be obtained from Professor T. M. Fraser, Department of Anthropology.

Admission

FOREIGN STUDENT ADMISSION

The Test of English as a Foreign Language (TOEFL), where available, will ordinarily be required of all applicants for admission to the Graduate School from countries whose native language is not English. Information about the examination may be obtained by writing:

Test of English as a Foreign Language
Educational Testing Service
Princeton, New Jersey, 08540 U.S.A.

Students scoring below 550 will normally be denied admission. Students scoring between 475 and 499, otherwise meeting the requirements set by departments, may be admitted provided they agree to attend, at their own expense, in the summer prior to admission, a summer institute in English such as the program of the Experiment in International Living at Putney, Vermont. All international students will be tested by the University of Massachusetts when they arrive on campus, and those testing below the established minimum will be required to take further work in English.

The program of study of graduate students undertaking a remedial English program will be subject to limitation by the Graduate Office.

ADMISSION OF FACULTY MEMBERS TO GRADUATE STUDY

A member of the faculty of the University with the rank of assistant professor or higher may not earn a graduate degree from the University. He may, however, do graduate work on a non-degree basis. A full-time staff member of the University may not carry more work in residence than an average of four credits per semester.

REQUIREMENTS FOR ADMISSION

1. An undergraduate cumulative grade point average of 2.75 or better is normally required.
2. A Bachelor's degree or the equivalent from any college or university of recognized standing.
3. Two official transcripts of all previous college work (undergraduate and graduate).
4. Two letters of recommendation from persons in the field of the applicant's academic major at the institution most recently attended. Applicants whose academic references would go back more than five years may substitute other references if desired.
5. Acceptance by the department and by the Admissions Committee of the Graduate Council.
6. The Graduate Record Examination (Aptitude and Advanced Tests) should be submitted for admission to the Graduate School. The Advanced Test should be taken in the field of study in which the applicant intends to earn a degree. Each applicant should have a transcript of his scores sent to the Graduate School.



Application Procedures For Admission and Readmission

ADMISSION

Holders of Bachelor's degrees, from this University or from other institutions having substantially the same requirements for the Bachelor's degree, are eligible to apply for admission to a program of graduate studies. Admission is only for the semester requested and does not imply automatic admission at a later date. Application blanks may be obtained by writing to the Admissions Office, Graduate School, University of Massachusetts, Amherst, Massachusetts 01002.

Application for admission, with supporting documents, should be received by April 15 for September enrollment, by October 1 for January enrollment, and by May 1 for Summer Session enrollment.

An applicant should request registrars of colleges previously attended to send transcripts directly to the Graduate School. Transcripts should be sent as soon as the first-semester grades of the final year's work have been recorded. A final transcript showing that the bachelor's degree has been awarded must be received before the applicant enters the Graduate School. There is no application fee.

READMISSION

A degree candidate who is not enrolled in courses for one academic year and has not paid the *program fee* (see p. 22), must secure an application form from the Graduate Admissions Office and apply for readmission. A degree candidate enrolled in the University during the spring semester may attend the following summer/fall semester without filing for readmission.

Applicants are urged to take the Graduate Record Examination at the November testing or earlier. The results of later testings are frequently not available before decisions on admission must be made. The Educational Testing Service, 20 Nassau Street, Princeton, New Jersey, 08540, or Box 27896, Los Angeles, California, administers the test in the United States as well as abroad. Addresses of test centers can be obtained from them. On the University campus the test is given by the University Guidance Office.

Applicants for admission to the School of Business Administration are required to take the Admission Test for Graduate Study in Business rather than the Graduate Record Examination. This test is also administered by the Educational Testing Service. Inquiries concerning it should be addressed to the Service.

Admission to the Graduate School does not imply admission to candidacy for an advanced degree. Such candidacy is subject to specific requirements as defined by the several departments. The student must secure the approval of the Head of the Department in which he desires to major before he can become a candidate for a degree in that subject.

Applicants will be admitted to the Graduate School in one of the following categories:

Degree Status: a student admitted as fully qualified to undertake a program toward a graduate degree.

Provisional Status: a student admitted on a probationary status. At the conclusion of a semester of work—or two semesters if the department wishes—the student is either admitted to degree status or refused admission. If he is admitted to degree status, credits earned while in a provisional status are acceptable toward his degree if approved by his Guidance Committee.

Special Non-Degree Status: open to students who have a bachelor's degree. The student applying must have departmental approval to ensure space being available, and must be a United States citizen or national.



Tuition and Fees

TUITION

All graduate students pay tuition at the following rates: Residents of Massachusetts—\$10/credit hour up to \$100 per semester; non-residents—\$15/credit hour up to \$150 per semester. In order to register as a Massachusetts resident, a student must have on file a Certificate of Residence properly authenticated by his Town or City Clerk.

GENERAL Fees (also see Medical-Surgical Section)

Graduate students enrolled for 5 or more credit hours currently pay \$55 for the Fall semester. This General Fee includes such facilities and services as Infirmary, Student Union, I.D. card and Graduate Student Senate Tax. The General Fee is not optional.

Graduate students enrolled for less than 5 credit hours currently pay \$10.50 for the Fall semester. This fee includes an I.D. card, Graduate Student Senate Tax and one-half of the charge for Student Union. Infirmary services are optional at \$35 per semester if enrolled for less than 5 credit hours.

Holders of fellowships or assistantships who receive a waiver of tuition do not thereby receive a waiver of fees. Each student pays his own fees unless special arrangements are approved by the Dean of the Graduate School.

During the Summer Session, tuition charges are as stated above, but fees are assessed on a weekly basis.

PROGRAM FEES

Graduate students not enrolled for any course credits, but who are candidates for a degree, shall pay a Program Fee of \$10 each semester until graduation. If a student does not pay this fee but later seeks readmission, he shall pay the accumulated Program Fees plus a readmission fee of \$50. Students seeking readmission should also secure an Application for Admission form from the Graduate School and follow the procedure described under the Readmission section.

COMMENCEMENT FEE

There is a \$10 Commencement fee for graduation. This fee should be paid by the time a student registers for his final semester.

MEDICAL-SURGICAL INSURANCE

This is an optional plan intended to supplement the care received by students at the Infirmary. It provides hospital, medical and surgical care on a twelve-month basis for injuries or illness during the school year, holidays, summer vacation and other times when the student is off campus. Students who register for the fall semester have only one opportunity to enter or reject this program each year, at the time of payment of the fall semester bill. It is also offered on the spring semester bill for new spring registrants only. The fee for medical-surgical insurance is \$27 per year. Married students desiring family coverage under the plan now in existence at the University are advised to contact the Student Health Services. The cost for family coverage is an additional \$31 per quarter.

All foreign students are required to carry the medical-surgical insurance regardless of the number of credits taken. For all other students, medical-surgical insurance is optional but recommended.

STUDENT FINANCES

Students should arrive on campus with enough cash on hand to pay their tuition, fees, and insurance bills as well as room and board for at least one month after registration. Normally, this will be between \$400 and \$500. (Students receiving financial assistance from or through the University will not receive their first checks for approximately three to four weeks after registration.)

WAIVER OF TUITION AND FEES

Holders of certain titles are exempt from tuition and certain fees. Waiver forms must be processed before registration in order to take advantage of exemptions.

Waiver of Tuition

Full-Time Community College Faculty

The Trustees of the University of Massachusetts have authorized waiver of tuition, but not fees, for faculty members of the Massachusetts Regional Community Colleges taking courses at the University of Massachusetts providing that



the faculty members are full-time before taking such courses and return to full-time teaching in their Community College after completion of course work.

When a faculty member who is eligible for such a tuition waiver desires to take a course at the University, his Community College President should supply him with a memorandum certifying that he is a full-time faculty member. Such waivers will apply for the period from September 1 to the following August 31.

Vietnam Veterans

Tuition may be waived for any Vietnam veteran, as defined in the General Laws, whose service was credited to the Commonwealth. Any veteran who is eligible for this waiver is advised to contact the Veterans Coordinator, Whitmore Administration Building, for further information.

TUITION AND FEE CHANGE

Tuition and fees are subject to change upon action of the Board of Trustees and may be changed without prior notice.

TUITION AND FEE REFUNDS

A student who leaves the University for any reason, except as specified below, before a semester is completed will be granted a pro rata refund of tuition and fees. A student who makes an advance payment and then for any reason does not attend any part of the next semester or term at the University will be given a full refund of tuition and fees. A student who is involuntarily called into military service before the completion of a semester will be given a pro rata refund of tuition and fees provided that he receives no academic credit for the work of that semester. If academic credit is given, there will be no refund. A student who is suspended or expelled from the University for disciplinary reasons forfeits all rights to a refund.

Refunds are first applied to reimburse scholarship or loan funds (up to the full amount), and any remaining amount is refunded to the student.

REFUND SCHEDULE

Regular Term

- a. Within the first two weeks from the beginning of semester or term—(Registration Day)—80%
- b. During the third week—60%
- c. During the fourth week—40%
- d. During the fifth week—20%
- e. After the fifth week—No refund

Summer Session

- a. During the first week—60%
- b. During the second week—20%
- c. After the second week—No refund

RENT

The charge per semester is \$292.50, including telephone facilities, which are not optional. (See Housing, following.) A deposit of \$50 is required within ten days after receipt of room assignment.

ROOM RENT REFUNDS

It is the policy of the University that there will be no refund of prepaid room rent after the semester has begun. A student who has made an advance payment of room rent will be granted a full refund of prepaid room rent if he fails to attend any part of the next semester or term or does not reside in a residence hall or other housing. Students involuntarily called to military service may be granted a refund on a pro rata basis.

BOARD

Graduate students may purchase meal tickets and eat at any line in either the North Commons, the South Commons, or the Southeast Commons Number 1. Graduate students living in Prince House or any of the Southwest Area residences are required to purchase five-day meal tickets.

The cost is \$265 for a five-day meal ticket. There are no week-end meals on a contract basis. Food services will be available week-ends on an individual purchase basis. Students not required to purchase a meal ticket may purchase individual meals on a cash basis.

BOARD REFUNDS

Authorized refunds will be made on a pro rata basis. A student who is suspended or expelled from the University for disciplinary reasons forfeits all rights to a refund.



Housing

The University provides a limited amount of housing on campus for married and single graduate students. Information on locating off-campus housing is also provided and should be requested from the Off-Campus Housing Office, Room 236, Whitmore Administration Building.

At present, one of the new residence halls in the Southwest Residential College is reserved for use by unmarried graduate students. Prince House is a four-story building containing three large social lounge areas, a recreation room, a television room, vending machines and a snack lounge on the first floor. Student bedrooms are for double occupancy only. Students desiring to live in the new complex may make application to the Director of Housing, Room 232, Whitmore Administration Building. Terms of occupancy are indicated below.

1. Space in the building will be assigned on a full semester basis only.
2. Both American and foreign single graduate students, male or female, will be admitted to the limits of available space. Assignments will be made for a period of one academic year with an option to maintain occupancy during the summer at a fee to be arranged. Each individual assignment will state the amount of board and room charged. The University reserves the right to alter fees whenever necessary.
3. Residence hall rules and regulations require that occupants assume the responsibility for damage in and to their rooms; hot plates or any other equipment for preparing hot food are expressly prohibited.



4. Space will not be held if the \$50 room deposit is not received by the Housing Office within ten days after room assignment. The balance of charges must be paid on or before Registration Day.

5. Room applications are issued by the Housing Office and the Graduate School Office, but all applications will be screened by the Graduate School for eligibility before assignments are made. While every effort will be made to comply with requests, the University reserves the right to make room assignments in accord with existing vacancies. Early applications will receive precedence.

APARTMENTS FOR MARRIED STUDENTS

The University owns and operates approximately 150 unfurnished apartment units of various sizes for faculty, staff, and married students. It is anticipated that an additional 240 units will be ready for occupancy in September, 1970. Information on apartment descriptions, assignment procedures, and applications may be obtained from the Off-Campus Housing Office, Room 236, Whitmore Administration Building. Limited availability of vacancies necessitates immediate application and a probable one-year waiting period.

OFF-CAMPUS HOUSING

A card file of off-campus apartments, houses, and rooms is maintained at the Off-Campus Housing Office for use by any person connected with the University. Due to daily changes in these rental listings and the fact that all off-campus arrangements must be made directly by the parties involved, these listings cannot be secured except by a personal visit. Information about local garden apartment developments plus other services provided may be obtained from the Off-Campus Housing Office, Room 236, Whitmore Administration Building.

Assistantships and Fellowships

UNIVERSITY FELLOWSHIPS

These fellowships are unrestricted and are awarded to graduate students on a University-wide basis by competition. They are intended to encourage and assist superior students in pursuing graduate study and in completing the requirements for graduate degrees in the minimum possible time.

A recipient of a University fellowship must enroll as a full-time student. He is not required to give formal service to the University or to the department in which he is enrolled.

The stipend is \$2,600 for the academic year. The fellowships are not renewable beyond the third year. They are payable in weekly installments from September through May and carry a waiver of tuition.

Application forms are supplied as part of the regular admissions materials by the Graduate Office of the University of Massachusetts. Completed applications must be submitted to the applicant's major department before February 1 for the following September. Awards are announced by April 15. Applicants not currently enrolled in graduate study at the University should also have on file an application for admission to the Graduate School.

FEDERAL FELLOWSHIPS

The University participates in the various Federal fellowship programs sponsored by the National Defense Education Act (NDEA), the National Science Foundation, and the National Institutes of Health. Suitable applicants are recommended by the academic departments.

GRADUATE ASSISTANTSHIPS

The University offers a number of graduate assistantships in the instructional and research programs of various departments. The stipend varies, up to a maximum of \$3,500 for the academic year, depending upon the qualifications of the applicant. Graduate assistants are not required to pay tuition if their stipend is \$625 or more for the semester. A stipend of \$1,250 or more over both semesters entitles the assistant to a waiver of summer tuition also. Such assistants may take up to 13 credits per semester, but the total for both semesters of any academic year may not exceed 24 credits. Application should be made to the Head of the Department involved.

RESEARCH ASSISTANTSHIPS

A number of research assistantships are available to qualified graduate students. These are made possible because funds are provided by (a) various industries, (b) the Experiment Station, or (c) research grants awarded to members of the Graduate Faculty either from sources outside the University or from a fund provided by the University and administered by the Research Council. Stipends



vary with the type of work and the amount of time involved. Interested students should make application to the Head of the Department in which they plan to work.

OTHER FELLOWSHIPS

Direct fellowship awards are available from a number of foundations. Students may obtain information concerning these fellowships from the 1970 *Annual Register of Grant Support*, copies of which are located both in the Graduate School Office and in Goodell Library. Specific questions can be addressed to the Coordinator of Research of the Graduate School.

NDEA LOANS

Information concerning application for these loans can be obtained from the Placement and Financial Aid Office, Whitmore Administration Building. Applications should be filed by March 1, prior to the academic year for which aid is sought.

Graduate students may borrow as much as \$2,500 per year. No student may borrow in excess of \$10,000. The repayment period and the interest do not begin until nine months after the student ends his studies. The loans bear interest at the rate of three percent per year and repayment of principal may be extended over a 10-year period. If a borrower becomes a full-time teacher in an elementary or secondary school or in an institution of higher education, as much as half of the loan may be forgiven at the rate of 10 percent for each year of teaching service. Borrowers who elect to teach in certain eligible schools located in areas of primarily low-income families may qualify for cancellation of their entire obligation at the rate of 15 percent per year. Loans are awarded on the basis of need and money available. Repayment may be deferred up to a total of three years while a borrower is serving in the Armed Forces, with the Peace Corps, or as a Volunteer in Service to America (VISTA). Repayment is deferred for as long as a borrower is enrolled at an institution of higher education.

Programs Offered

Major fields in which courses are offered leading to the degree of Doctor of Philosophy:

Agricultural and Food Economics	German
Agricultural Engineering	Government
Animal Science	Hispanic Languages and Literature
Anthropology	History
Astronomy	Human Movement
Biochemistry	Industrial Engineering
Botany	Linguistics
Business Administration	Mathematics
Chemical Engineering	Mechanical Engineering
Chemistry	Microbiology
Civil Engineering	Nutrition and Food
Comparative Literature	Ocean Engineering
Economics	Philosophy
Electrical Engineering	Physics
English	Plant Pathology
Entomology	Plant Science
Environmental Engineering	Polymer Science and Engineering
Food Science and Technology	Psychology
Forestry and Wood Technology	Sociology
French	Soil Science
Geology	Speech
	Wildlife and Fisheries
	Biology
	Zoology

In several fields, degrees are awarded under the Five-College Cooperative Ph.D. Program: All departments in the biological sciences; chemistry, French, geology, German, philosophy, physics, and Hispanic languages and literature.

Major fields in which courses are offered leading to the degree of Doctor of Education:

Curriculum and Instruction Specialists	School Administration
	School Guidance

Major fields in which courses are offered leading to the Master's Degree:

Accounting	Biochemistry
Agricultural and Food Economics	Botany
Agricultural Engineering	Business Administration
Animal Science	Chemical Engineering
Anthropology	Chemistry
Art History	Civil Engineering
Astronomy	Comparative Literature

Computer Science	Management Science
Dramatic Arts	Marine Sciences
Economics	Mathematics
Education	Mechanical Engineering
Electrical Engineering	Microbiology
English	Music
Entomology	Nursing
Environmental Engineering	Nutrition and Food
Fine Arts	Ocean Engineering
Fisheries Biology	Philosophy
Food Science and Technology	Physical Education
Forestry	Physics
French	Plant and Soil Sciences
Geology	Plant Pathology
Germanic Languages and Literature	Polymer Science and Engineering
Government	Psychology
Hispanic Languages and Literature	Public Health
History	Regional Planning
Home Economics	Slavic Languages and Literature
Human Development	Sociology
Industrial Engineering	Speech
Labor Studies	Statistics
Landscape Architecture	Wildlife
Linguistics	Wood Technology
	Zoology

EVENING AND CONTINUING EDUCATION COURSES

Although a few evening courses are available (mainly in education), the University does not offer complete degree programs in the evening. As this Bulletin goes to press, a Continuing Education Program is being developed which will include evening and Saturday courses. Inquiries regarding the Continuing Education Program may be directed to Dr. William C. Venman at the Office of Continuing Education, Murray D. Lincoln Center, University of Massachusetts, Amherst, Massachusetts 01002.

CERTIFICATE OF ADVANCED GRADUATE STUDY

The School of Education conducts several programs leading to the Certificate of Advanced Graduate Study. These are not degree programs. These programs call for a minimum of 60 semester hours of graduate work beyond the bachelor's degree, of which at least 30 must be taken at the University and of these at least 15 must be taken in the School of Education. Of all the course work leading to the Certificate, at least 18 credits must be 700-900 courses. No credit is valid after 10 years. The final 30 credits must be taken within a four-year period.



Doctoral Degree Requirements

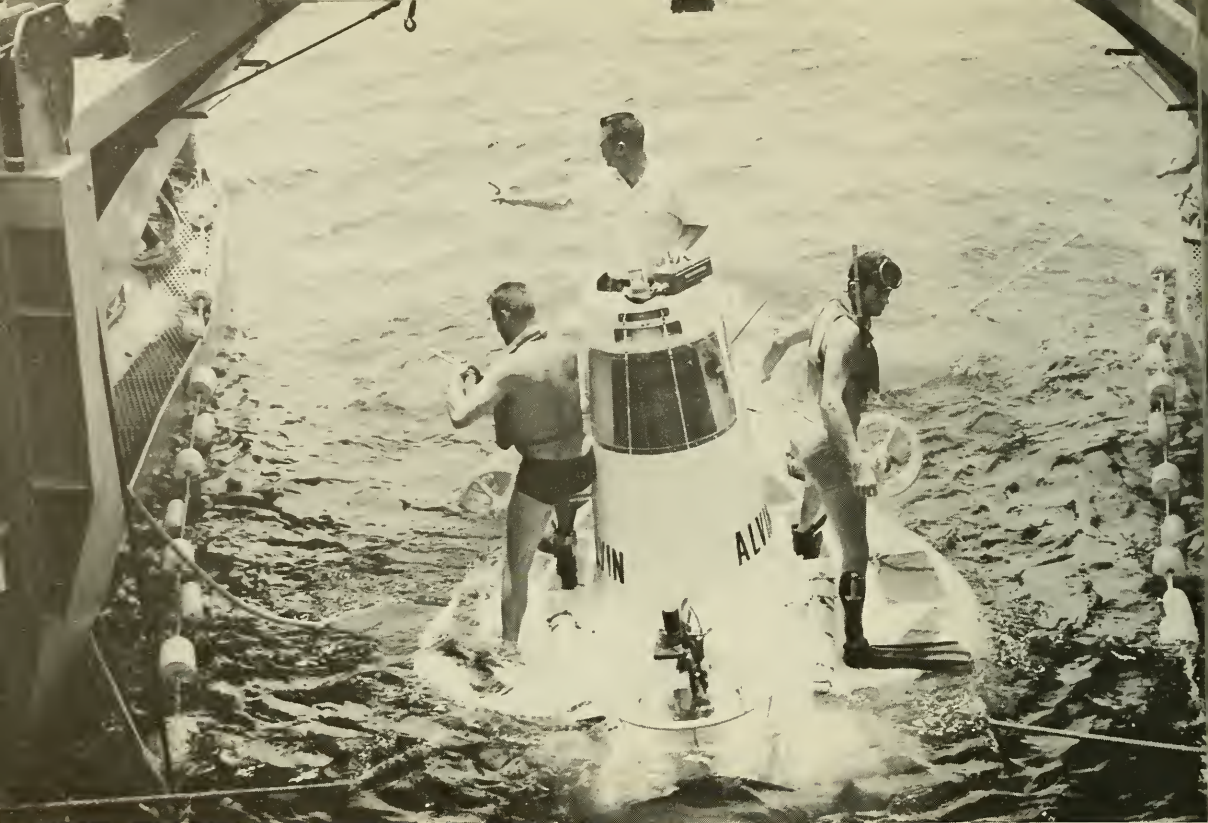
All requirements for the several advanced degrees must be completed by May 20 if the degree is to be received at the Commencement in June, September 15 for students planning to receive their degrees in the fall, February 1 for students planning to receive their degrees at the end of the fall semester.

DOCTOR OF PHILOSOPHY AND DOCTOR OF EDUCATION

In order to provide proper direction for the doctoral candidate, a Guidance Committee or an Adviser will be appointed as soon as the student arrives on campus. This Committee, or Adviser, will be appointed from among the Graduate Faculty, recommended by the Department Head of the student's major department.

The Guidance Committee, or Adviser, should meet with the candidate as soon as possible after the appointment has been made. For each student the department shall send to the Graduate Office the name (or names) of the Adviser(s) (or the members of the Committee). In addition to this original meeting with the student, the Guidance Committee's or Adviser's responsibilities shall be to:

- a. Approve the program of the student.
- b. Approve the procedure for satisfying the language requirements.



- c. Arrange for the preliminary comprehensive examination of the student.
- d. Report the fulfillment of the above requirements to the Head of the major department. If a Guidance Committee has been appointed, a unanimous vote of the committee is necessary in reporting the fulfillment of the above requirements.

As soon as the student has passed his preliminary comprehensive examination, a Dissertation Committee shall be appointed from members of the Graduate Faculty, recommended by the Department Head of the student's major department. The Dissertation Committee will consist of three members of the Graduate Faculty, of whom at least two shall be from the major department. The Guidance Committee and the Dissertation Committee may be the same, although this is not necessarily the case. The responsibilities of the Dissertation Committee shall be to:

- a. Supervise the dissertation project and arrange for the final examination.
- b. Report the fulfillment of all requirements to the Head of the major department, the vote of the Committee to be unanimous.
- c. When the Dissertation Committee is recommended, a fourth member will be appointed by the Dean of the Graduate School. This member will act as the representative of the Graduate Council, and will attend all meetings of the

Dissertation Committee, including the final examination as a voting member. If at the final examination, two members of the Dissertation Committee cast a negative vote, the candidate will be informed that he has not passed the examination. If there is only one negative note, the degree will be held up pending action of the Graduate Council. A unanimous vote of the Dissertation Committee is required for the student to pass the final examination.

The degree is conferred upon graduate students who have met the following requirements:

1. The preparation of a dissertation satisfactory to the Dissertation Committee, the Department Chairman, the Adviser, and those members of the faculty in the major department designated by the Department Chairman to approve the dissertation.

2. The successful completion of graduate courses in the major field. The Guidance Committee or Adviser will determine the number of graduate credits which the student must earn.

3. The passing of a preliminary comprehensive examination to be conducted by the major department, to be passed not later than eight months before the completion of the candidate's work. If the student fails the comprehensive examination he may, at the discretion of the Guidance Committee or Adviser, be permitted a second and final opportunity.

4. The satisfactory completion of foreign language reading requirements (see page 43). Each department specifies its own requirements under Graduate Council policy. These requirements are listed in the departmental sections of this Catalog.

5. The passing of a final examination, at least partly oral, conducted by the Dissertation Committee primarily upon, but not limited to, the contents of the candidate's dissertation. The examination cannot be scheduled until all members of the Committee and those members of the major department designated by the Department Chairman have approved the dissertation. The oral examination is to be conducted by the Committee. The Examining Committee is to consist of the Dissertation Committee and such members of the major department as the head shall appoint. In order to pass, the candidate must receive the unanimous vote of the Dissertation Committee. Not more than one dissenting vote shall be allowed in the total Examining Committee present.

6. The satisfactory completion of the residence requirement. The equivalent of at least one academic year of full-time graduate work must be spent at the University. The requirement for a year in residence may be satisfied only by the student's physical presence on campus for two consecutive semesters. This may be either a fall-spring sequence or a spring-fall sequence. It cannot be satisfied by a summer session and a semester of the regular school year. The student need not reside in Amherst, although he should reside in one of the surrounding communities. He cannot hold a full-time job off campus while satisfying the residence requirements. If he is a teacher in a school system in the area he may teach no more than one course while satisfying the residence require-

ment. The requirement is not stated in terms of credit hours because the student might satisfy the requirement while working on his dissertation without being registered for a specific number of credits. The intent is that the student should actually be on the campus so that the faculty can become acquainted with him and be in a position to recommend him in connection with his future career and have knowledge of him when it is necessary to recommend him for his degree.

7. Credits for each graduate course become invalid nine years following the date of completion of the course except that graduate credits previously earned at another institution which have been accepted by the Graduate Council for full credit toward the requirements of the Ph.D. or Ed.D. degree shall become invalid nine years from the date of first registration in the doctoral degree program. A Ph.D. or Ed.D. candidate should take a minimum of one half of his *course work* for the degree at the University. In those cases where this would be less than the amount of course credit earned for a master's degree the full credit of the master's degree would be accepted. Where significant deviations from this policy are desired, it is suggested that they be cleared first through the Graduate Dean.

DOCTOR OF EDUCATION

The requirements for the Doctor of Education degree are the same as listed for the Doctor of Philosophy degree above.

FIVE-COLLEGE COOPERATIVE DEGREE PROGRAMS

A cooperative Ph.D. program has been established by Amherst, Hampshire, Mount Holyoke and Smith Colleges and the University. The degree is awarded by the University, but some and perhaps much and in a few exceptional cases even all of the work leading to the degree might be done in one or more of the other institutions.

When a student has been awarded a degree under this program, the fact that it is a cooperative Ph.D. degree involving Amherst, Hampshire, Mount Holyoke and Smith Colleges and the University will be indicated on the diploma, the permanent record card and all transcripts, as well as on the Commencement Program.

The requirements for the degree are similar to those for the Ph.D. degree at the University except for the statement relating to "residence." For the cooperative Ph.D. degree "residence" applies to the institution where the thesis work is being done.

The following departments are authorized to offer the cooperative Ph.D. degree: all the departments in the biological sciences; chemistry, French, geology, German, philosophy, physics, and Hispanic Languages and Literature.

The names of the Graduate Faculty at cooperating institutions are listed in the appropriate departments.

Students interested in these programs should write to the Dean of the Graduate School.



Doctoral Dissertation

A dissertation must be on a topic in the field of the candidate's major subject, and must indicate that its writer possesses the ability and imagination necessary to do independent constructive thinking. The following rules should be adhered to in the preparation and presentation of a dissertation:

The objective should be to make a contribution to knowledge. When completed, the dissertation should be of a quality worthy of publication as a contribution from the department concerned.

The dissertation in its completed form will be judged largely upon the ability of the author to review literature and reach definite deductions; to formulate a problem, plan a method of attack, and work out a solution; and to summarize his material and draw conclusions. Scholastic attainment in writing and presenting the results of the study will also be an important factor in the evaluation.

1. The professor who is responsible for the direction of the student's research will be appointed the chairman of the student's Dissertation Committee. Only members of the Graduate Faculty may be appointed to a committee.

2. It is the responsibility of the chairman of the Dissertation Committee to arrange a conference with other members of the Committee and the student for the purpose of discussing the research problem before approving the dissertation outline. This should be done as soon as possible after the appointment of the Committee.

3. A copy of the student's dissertation outline is then to be signed by each member of the Committee to indicate approval of the outline and to indicate the fact that a conference with the student has been held. The signed copy is then to be sent to the Dean of the Graduate School.

4. The Committee will have direct charge of all matters pertaining to the dissertation. The dissertation must have the unanimous approval of this Committee and the approval of the major department before arrangements are made for the final examination for the degree.

5. Two copies will be supplied to the Graduate School. An unbound original and one bound copy are required. The student is responsible for the binding of the dissertation.

6. Because of the time required to give adequate consideration to the research conducted by the student, it is highly desirable that the dissertation be submitted to the committee not later than April 15, and deposited with the Dean of the Graduate School by May 20.

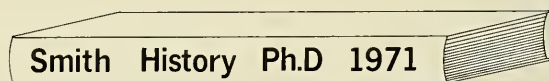
7. It is desirable to secure as much uniformity of style in dissertations as is practicable. However, different disciplines have worked out widely accepted distinctive research styles which should be mastered by the student whose life work is to be in the discipline. The following recommendations are intended to achieve as much uniformity as is practicable:

a. *The University of Chicago Manual of Style* shall be the Graduate School standard. However, any school, college or department may specify substitute standards agreed upon in that discipline.

b. The original of the Ph.D. dissertation is left unbound. The second (library) copy should be bound in black in a permanent waterproof buckram.

c. Gold lettering is required on the spine of bound dissertations. Lettering shall read down from the top in the following order: author's last name, name of department, degree and year of degree. The name of the department may be abbreviated if necessary. No other lettering is necessary.

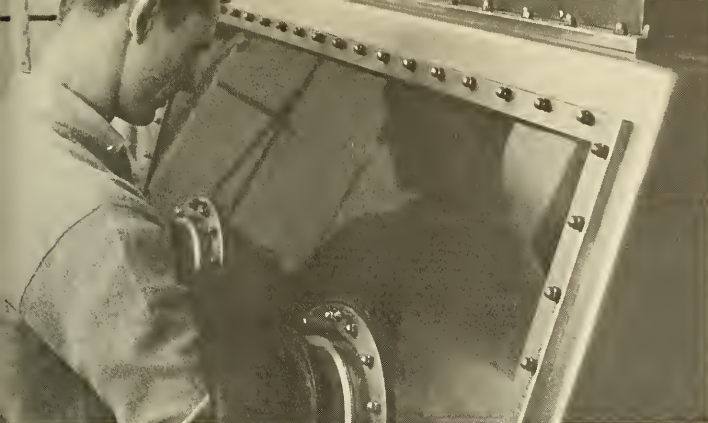
Example:



d. All typed copies of theses or dissertations must be on 100% Rag Extra #1 Quality paper, not less than 20-pound in weight and 8½" x 11" in size. This paper is available at the University Store, and since the paper is specifically designed to yield best possible typing, erasure, microfilming, and permanence results, no substitutions should be made. It is also strongly recommended that all Xerox copies be on this paper. This can be easily arranged by supplying your copy service with the special paper in the appropriate quantity. Margin to the left shall be 1½ inches; margin to the right, 1 inch.

e. Any method of reproducing duplicate copies is acceptable that produces the required number of clear, neat, and permanent copies.

f. The form of doctoral dissertations must conform to the "Suggestions for the Preparation of Dissertations for Microfilming" which may be found in the Handbook for Graduate Faculty and Students. This booklet may be obtained in the Graduate Office.



g. Form of title page. The title page should be arranged in this order:

1. Title.
2. Name of author.
3. "Submitted to the Graduate School of the University of Massachusetts in partial fulfillment of the requirements for the degree of _____."
4. Degree.
5. Date (month, year).
6. Major subject.

h. Following the granting of the doctorate, the Graduate School will have the dissertation microfilmed. The dissertation must be put into condition for publication on microfilm with as much care as if it were to appear in printed form and must have the approval of the student's Dissertation Committee. The student should supply the Graduate School with an unbound original copy and one bound copy of the dissertation. The original unbound copy will be returned to the Library, after being microfilmed, for binding. The student will submit a money order or a certified bank check for \$3.50 made out to the Library Binding Trust Fund. This copy will be preserved in the central library as an archival copy. The bound copy will be located in either the central library or a branch library, as appropriate, for circulation. Some departments require an additional bound copy for their own file. The student must also provide an abstract in duplicate of fewer than 600 words.

The microfilm fee of \$30 covers microfilm publication of the dissertation by University Microfilms Library Services, and the publication of the abstract by them in *Dissertation Abstracts*. The microfilm fee covers the cost of copyright in the author's name. The dissertation will be catalogued in the Library of Congress and in the University of Massachusetts Library. Microfilm copies may be purchased from University Microfilms Library Services, Xerox Corporation, Ann Arbor, Michigan 48106.

Publication by microfilm does not preclude the printing of the dissertation in whole or in part in a journal or as a monograph.



Master's Degree Requirements

In addition to the Master of Arts (M.A.) and Master of Science (M.S.) degrees the University also offers the following Master's degrees: *Master of Arts in Teaching (M.A.T.), Master of Business Administration (M.B.A.), *Master of Education (M.Ed.), *Master of Fine Arts (M.F.A.), *Master of Landscape Architecture (M.L.A.), Master of Music (M.M.), *Master of Regional Planning (M.R.P.), Master of Science in Accounting (M.S. Acctg.), Master of Science in Chemical Engineering (M.S.Ch.E.), Master of Science in Civil Engineering (M.S.C.E.), Master of Science in Electrical Engineering (M.S.E.E.), *Master of Science in Environmental Engineering (M.S.Envr.E.), Master of Science in Industrial Engineering (M.S.I.E.), Master of Science in Management Science (M.S.Mgt.S.), Master of Science in Ocean Engineering (M.S.O.E.), and Master of Science in Mechanical Engineering (M.S.M.E.).

The basic requirements for the Master's degrees are given below. *Programs asterisked above have additional requirements. These are listed in the General Information section. See also the departmental sections for more detailed information.

1. Thirty graduate credits, of which not more than six of grade B or better may be transferred from other institutions with the consent of the instructor. Twenty-one of the 30 credits must be in the major field. If a thesis is offered, six credits must be earned in 700-900 series courses; if a thesis is not offered, 12 credits must be earned in 700-900 series courses. Not more than 10 credits may be earned by means of a thesis. No credit is valid after six years.

2. The thesis is optional with the school or department, but if one is required,

it shall be under the supervision of a committee recommended by the major department. The Thesis Committee will consist of one or more members of the Graduate Faculty at the discretion of the Head of the Department, and should be appointed as soon as possible after the student's first registration in the Graduate School. As soon as the student arrives on campus, and prior to the appointment of a thesis committee, an Adviser, or Guidance Committee, should be appointed for the student from the members of the Graduate Faculty. Once the student has selected his thesis topic, the Guidance Committee may serve as the Thesis Committee, although these two committees are not necessarily the same.

The thesis must be approved by the Thesis Committee, the Department Chairman, the Adviser, and those members of the faculty in the major department designated by the Department Chairman to approve the thesis. The candidate must pass a general oral examination (not limited to the thesis topic) to be conducted by an Examining Committee of at least three members of the Graduate Faculty. This examination must be taken whether the student writes a thesis or not. The examination will cover the work of the student in preparing for the Master's degree. The recommendation of two of the three members of the Examining Committee shall be requisite to receiving the degree. If a student offers a thesis, problem courses shall be limited to six credits; if a thesis is not offered, the limit shall be nine credits.

3. Students who are candidates for the Ph.D. degree may apply for the Master's degree when they have fulfilled the residence and course requirements for the doctorate, have passed the language examinations (if required) and have successfully completed preliminary comprehensive examinations for the Ph.D.

4. All foreign language requirements for the Master's degree are optional with the school or department.

5. Course credits used by any student for fulfilling the requirements for a Master's degree may not be used by the student for fulfilling the requirements for any other Master's degree at this University.

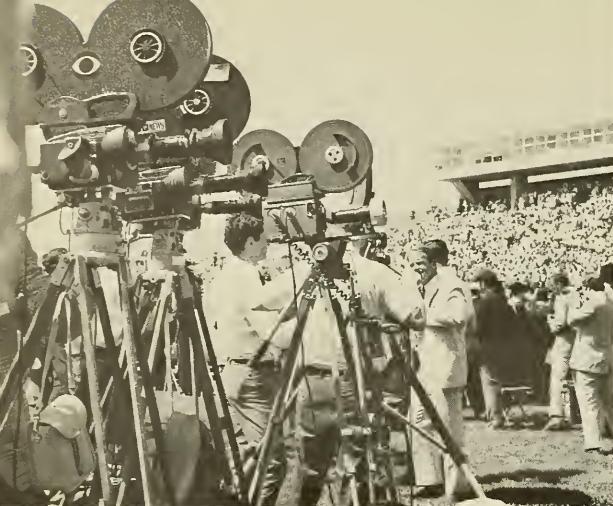
MASTER OF EDUCATION

The content of this program is under review by the School of Education. Please refer to School of Education section of this Bulletin.

MASTER OF ARTS IN TEACHING

This is a cooperative program between the various Colleges and Schools of the University and the School of Education. The program for elementary and secondary school teaching is intended primarily for graduates of approved liberal arts institutions who have had little or no course work in professional education. The program for community college teaching is intended for graduates of approved liberal arts, engineering, business, and public health institutions who have programs needed in community colleges.

The professional education course content of this program is under review. Please refer to the School of Education section of this Bulletin.



MASTER OF FINE ARTS

This degree is particularly designed for those interested in the creative aspects of the arts. The degree may be obtained from the Department of Art for work in the visual arts, the Department of English for work in creative writing, or the Department of Speech for work in dramatic art.

The basic requirements for this degree are:

1. Sixty credits which must be at the graduate level. Not more than 12 credits may be transferred from other institutions *where the department considers it appropriate*; 12 hours should be taken in one or more of the art fields other than that of the major department. No more than 18 credits may be earned for the thesis project. No credit is valid after eight years.

2. The exact nature of the thesis project will be determined by the student's major professor in conference with the student. It is to be understood that the project will be productive of a work of art. A written analysis of the work itself and of the procedures used in producing it will be required. The candidate will be asked to pass an examination in his major field in addition to presenting his thesis project publicly.

The Master of Fine Arts Program is administered by an interdisciplinary committee appointed jointly by the Dean of the Graduate School and the Dean of the College of Arts and Sciences. Application for admission to the program should be made to the head of the department in which the student wishes to major.

MASTER OF SCIENCE IN LABOR STUDIES

The graduate curriculum leading to the Master of Science in Labor Studies is an interdepartmental one, with responsibility for coordinating students' programs vested in the Interdisciplinary Committee recommended by the Advisory Council of the Labor Center and approved by the Dean of the Graduate School.

Students in this program will be individually advised by members of the Interdisciplinary Committee.

Two years is considered the normal period for completing this degree.

Students who successfully complete the graduate curriculum in Labor Studies will be prepared primarily for academic work, labor union employment, and government service.

The basic requirements for the degree are:

1. Forty-two graduate credits of which no more than nine may be transferred from other accredited institutions.

2. A thesis is optional.

3. Research project (in the first year), an internship (in the summer), and an administrative assignment in the worker's education extension teaching area (in the second year) will be expected of each candidate.

MASTER OF LANDSCAPE ARCHITECTURE AND MASTER OF REGIONAL PLANNING

The degree is conferred upon graduate students who have satisfactorily met the following requirements:

1. Work covering at least two years in residence, and a minimum internship in a public or private office of at least three months. Specific requirements concerning the nature of such practice are determined by the department.

2. The earning of not fewer than 46 credits, of which 28 shall consist of graduate level courses within the department, with specific exceptions at the discretion of the department.

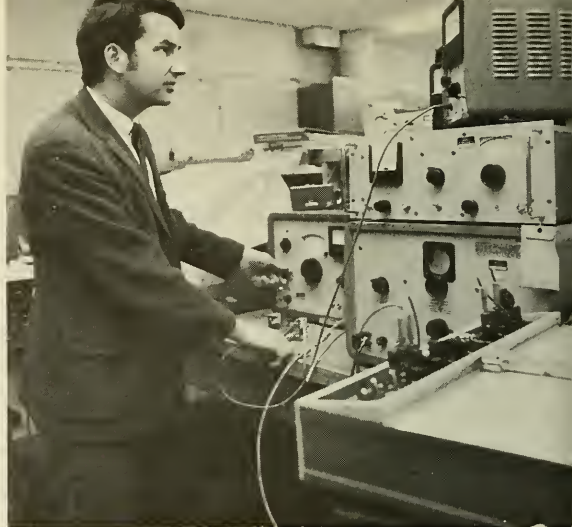
3. Preparation of a satisfactory thesis or terminal project.

4. The passing of a final examination, written and/or oral.

5. Recommendation by the Department of Landscape Architecture to the Graduate School for the awarding of the degree and approval of the recommendation by the Dean of the Graduate School.

MASTER OF SCIENCE IN ENVIRONMENTAL ENGINEERING

Although this degree is conferred by the Department of Civil Engineering, non-engineers are encouraged to apply. Students with baccalaureates from any of the following disciplines are eligible: engineering, physical science, natural science, social science, and public health. All candidates with non-engineering backgrounds must present satisfactory evidence of proficiency in the following: Elementary Differential Equations, General Chemistry, Introductory Physics, Statics, Fluid Mechanics, Engineering Hydraulics and Basic Environmental Engineering. In addition, the candidate must satisfy the curricula of one of the four fields of study in Environmental Engineering: Environmental Quality Engineering, Environmental Resources Engineering, Environmental Health Engineering or Air Pollution Engineering. Exceptions must meet the approval of the Departmental Environmental Engineering Committee, and the Department of Civil Engineering. A total of 31 credits must be earned, six of which may be for a thesis.



Master's Thesis

The requirements for the master's thesis are the same as those for the doctoral dissertation listed above (p. 31) with the following exceptions:

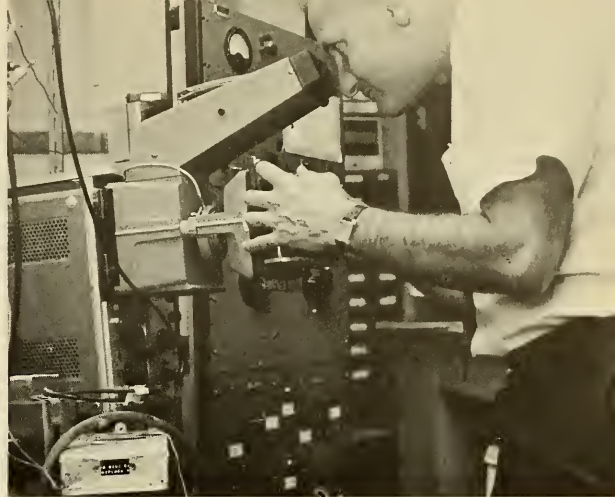
1. When a student has prepared his thesis outline, the Head of the Department submits to the Graduate Dean a recommendation for the student's Thesis Committee indicating which member is to be the chairman. The Thesis Committee may consist of one, two, or three members of the Graduate Faculty. If there are three members, *four* copies of the student's outline should be submitted with the Department Head's recommendation for the Thesis Committee. When the Dean of the Graduate School approves the Committee, a copy of the outline will then be returned to each member of the Committee with a cover sheet giving directions for the procedures to be followed. *Two* copies of the outline will be returned to the Chairman. After the Committee meets with the student and approves the outline, the extra copy sent to the Chairman should be signed by all members of the Committee and returned to the Graduate Office to be placed in the student's file. The Thesis Committee must be appointed at least *five months* before the student's expected graduation.

2. A bound original and one bound copy of the thesis are required. Both copies are to be bound in red waterproof buckram. The original copy will be preserved in the central library as an archival copy; the second copy will be located either in the central library or branch library, as appropriate, for circulation.

Some departments require an additional copy of the thesis for their own file.

3. These must be submitted to the Graduate School not later than May 20 of the academic year in which the degree is conferred.

4. Microfilming is not required for master's theses.



Graduate Reading Examination in Foreign Languages

Under Graduate Council policy, each academic department establishes foreign language reading requirements for the students pursuing advanced degrees in that department. The department decides the number of foreign languages and the level of competency it will require. For purposes of these requirements, a foreign language is defined as a language other than the student's native tongue and one in which there is a significant body of literature relevant to his academic discipline.

The alternative levels of competency which a department may select are:

- (1) Advanced level
- (2) Intermediate level
- (3) Journal level: reading knowledge sufficient to understand journals in the language in the student's academic disciplines
- (4) No foreign language competency.

A department may select any of these levels or any combination of them for as many languages as it wishes. When a department selects levels one or two, the student's competency will be judged by the score on the Graduate School Foreign Language Test. The passing grade for advanced and intermediate levels will be specified by the Graduate Council with any change to be published by the Council at least 60 days prior to the first testing at which it will apply. The current levels established by the Council are 600 and 450 respectively. The results will be recorded on the student's transcript. When a department selects level three, the student's competency will be decided by a departmental committee, but not by his Thesis or Dissertation Committee, and no entry will be made on his transcript.



General Regulations

1. Course numbering system at the University of Massachusetts:

001-099 Non-credit courses, non-quality point courses, entrance deficiencies, etc.

100-199 Undergraduate credit only: lower division.

200-399 Undergraduate credit only: upper division.

400-499 Professional courses which presume a bachelor's degree.

500-699 Graduate credit only: parallel to 200-399.

700-999 For graduate students only.

700 Special Problems.

800 Master's Thesis.

900 Doctoral Dissertation.

2. Academic average for regular standing:

A graduate student must maintain a 2.80 overall cumulative average in all graduate courses in the field of his major. A student cannot repeat such courses to raise his grade point average. He may repeat them to improve his knowledge of the subject matter. A student whose cumulative grade point average in the field of his major falls below 2.80 is placed on academic probation. If, at the end

of the ensuing semester, the cumulative average remains below 2.80, he is subject to academic dismissal upon the recommendation of his major department.

3. *Academic average for graduate degrees:*

In the grades which a student is offering to satisfy degree requirements, a minimum standard for satisfactory work is a B average. No degree will be awarded to a student whose course work earned for the degree at the University of Massachusetts is below 3.0.

4. Full-time students register for eight credits or more per semester. Part-time students register for seven credits or less per semester. Ph.D. candidates may be considered full-time students regardless of the number of dissertation credits for which they register, if the major department certifies that they are working full-time on research.

5. *Withdrawal regulations:*

- a.) To add, drop, or change a course, the student must obtain the written approval of the instructor concerned, his Faculty Adviser, and the Dean of the Graduate School. Signed cards are to be filed with the Graduate Office.
- b.) Within a period of two weeks from the beginning of a semester a student may add, drop, or change courses without penalty. No courses may be added after this date. Signed cards are to be filed with the Graduate Office.
- c.) Within a period of six weeks after the beginning of a semester a student may drop courses with a grade of W provided approval is obtained from the instructor and the student's major adviser. No courses may be dropped after this date except with a grade of WF unless special permission is obtained from the Dean of the Graduate School.
- d.) During periods (b) and (c) a student may withdraw from the University without academic penalty. Grades of W will be noted on his record. After six weeks, grades of WF or WP will be entered unless special permission is obtained from the Dean of the Graduate School. No student may withdraw from courses after final examinations begin.

6. *Incompletes:*

A student can obtain credit for an "incomplete" only by finishing the work of the course before the end of one calendar year from the time of enrollment in the course (whether or not he is enrolled). At the end of that period, if a grade is not submitted, an IF (incomplete F) will be recorded. The initiative in arranging for the removal of an "incomplete" rests with the student.

7. Candidates registering for thesis or dissertation credits (Thesis 800 and Dissertation 900) will register for credits recommended by the Thesis or Guidance Committees. These credits will remain "incomplete" except for the semester in which the thesis or dissertation is completed, when the grade will be either S (Satisfactory) or NS (Not Satisfactory) as recommended by the Thesis or Guidance Committee.

8. *Attendance at Commencement:*

Attendance of Master's candidates at the annual Commencement is desirable

but not required. Attendance of Ph.D. candidates at Commencement is required unless the candidate is excused by the Dean of the Graduate School.

9. *Five-college library use:*

The libraries at Amherst, Smith, Hampshire and Mount Holyoke Colleges are normally off-limits to graduate students from the University of Massachusetts. These library facilities are developed by these institutions to serve the needs of their own students. The physical facilities and the staff services are not adequate to the additional loads imposed by outside demands.

Graduate students who have been accepted for candidacy and are working on doctoral dissertations may use these libraries by obtaining special permission from the Dean of the Graduate School. Such requests must be initiated through the Chairman of the student's Guidance Committee.

Students enrolled in Five-College Cooperative Ph.D. programs may use the various libraries when the head of the department concerned has supplied the name of the student to the Graduate Office, which will then send proper notification to the area libraries.

Students taking courses on a campus other than their own are entitled to the use of the library on that campus for purposes of those courses only.

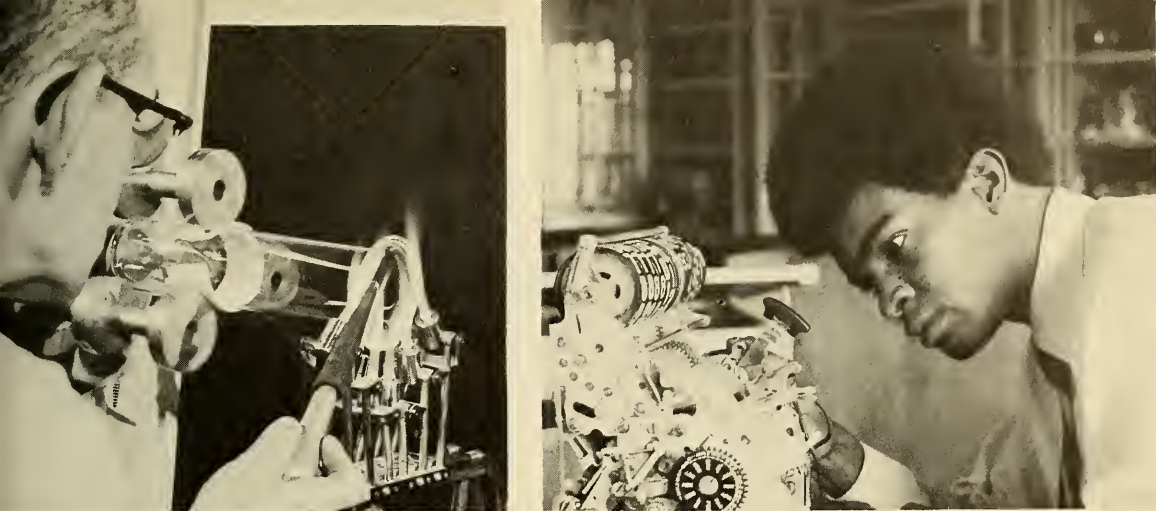
UNDERGRADUATES TAKING GRADUATE LEVEL COURSES

Registration of an undergraduate in a graduate course numbered in the 400, 700, or 800 series is subject only to the permission of the course instructor. An undergraduate student who wishes to register in a graduate course numbered in the 500 or 600 series must file a specific authorization, issued by the Head of the Department offering the course, with the undergraduate Registrar.

TRANSFER OF COURSES AND CREDITS TAKEN OVER AND ABOVE CREDITS EARNED FOR A BACHELOR'S DEGREE

An undergraduate student in his senior year at any of the five-college institutions (see p. 34) and who will earn during this year more credits than he will need for his Bachelor's degree, may register concurrently for graduate credits at the University of Massachusetts if he has the permission of his major adviser and of the graduate course instructor. He registers for these credits with his undergraduate Registrar. After he has completed the courses, if he wishes to transfer them to a graduate program, his undergraduate Records Office should send to the Graduate School an official statement listing the courses, credits, and grades, and certifying that they were over and above those needed by the student for his Bachelor's degree. The Graduate School will then record this information on a permanent record card and supply the student with transcripts bearing this legend:

The following graduate courses taken over and above credits required for the Bachelor's degree have been accepted by the Graduate School of the University of Massachusetts for full graduate credit.



Special Services Available to Graduate Students

GRADUATE COURSES DURING THE SUMMER

The University offers opportunities to pursue graduate courses during the summer. Details regarding courses offered, facilities for study, etc., may be found in the Summer Session Catalog, a copy of which is available upon request to the Director of the Summer Session at the University.

HEALTH SERVICES

Complete health care, financed by the student health fee, is available without additional charge to *all* students who have paid the Health Fee. The Infirmary, providing both in-patient and out-patient care, is located north of Brooks House. It includes supporting X-ray, laboratory, pharmacy and physical therapy facilities, and eighty beds for the care of students who need hospitalization.

Students will find services are most complete and readily available during regular out-patient hours: weekdays 8–11:30 a.m.—1–5 p.m.; and Saturdays 8:30 a.m.–12 noon for urgent medical problems only. Emergency care is available at all times, day or night.

If a student needs to stay in the Infirmary, an attempt will be made to provide an opportunity to study if he feels able. Student visitors will be allowed during specific hours; parents may visit at any reasonable hour.

The University Health Services provides guidance for the development of optimum physical, emotional, and social welfare in the University community. Most of its resources are directed toward health care for students. It has an active concern for matters of environmental health and safety affecting the welfare of students, faculty, employees, and visitors. An active mental health pro-

gram, recognizing the specific emotional needs of University students, includes diagnostic and limited treatment services. Orthopedic services can be arranged as the need arises. Hospitalization for conditions requiring more specialized care than is available in the infirmary can be arranged at the Cooley Dickinson Hospital in Northampton.

Any care rendered on campus by the Health Services staff is provided without additional charge to those who have paid the student health fee. Off-campus care can be arranged by the Health Services, but the cost of this care is a responsibility of the student. A supplementary insurance program has been developed to provide for most medical and surgical care not available at the Infirmary. This optional twelve-month coverage is available in September only.

Students are urged to consult a member of the Health Services staff upon any indication of a physical or emotional disorder. It is much easier for the staff, and less time-consuming for the student, to rectify minor difficulties before they have become disabilities.

Students who are under medical supervision prior to entrance are urged to have their physicians write the Health Services, giving reports and instructions in appropriate detail. In brief, the Health Services attempts to provide all students with a coordinated and comprehensive program of health supervision formerly provided by their family physicians.

All visits and information gained as a result of visits to the Health Services are treated as confidential and no such information will be released without the express permission of the student.

A Medical History-Health Evaluation Form must be filled out by each graduate student who has paid the Health Fee and submitted to the University Health Services prior to his first registration.

PLACEMENT AND FINANCIAL AID SERVICES

The services of the Placement and Financial Aid Office are available to all degree candidates. Interest-free, short term loans up to \$100 are available.

POST-DOCTORAL FELLOWS, RESEARCH ASSOCIATES AND VISITING SCHOLARS

Post-Doctoral Fellows and Research Associates will be entitled to faculty privileges for the duration of their appointments at the University. Qualified scholars who may desire temporarily the privileges of the library and research facilities of the University, and who are not candidates for a degree may, upon recommendation of the Dean of the Graduate School and the approval of the President, be appointed Honorary Fellows without stipend. Such Fellows will be entitled to faculty privileges.

GRADUATE STUDENT SENATE

The Graduate Student Senate serves as the representative body of graduate students at the University. It pursues policies and objectives that serve to advance the material and academic needs of the graduate community.



Description Of Courses

Before consulting the course descriptions listed in this section, students should become thoroughly familiar with the General Regulations governing registration for courses in the Graduate School. The regulations (See Page 44) cover such matters as graduate credit, course numbering system, changing or dropping of courses, and requirements regarding incomplete work in a course. Students should also acquaint themselves with the requirements governing the particular degree which they wish to earn. The requirements for the various degrees are listed on Pages 31-43.

For description of courses numbered from 100 to 399, refer to the current Undergraduate Course and Faculty Directory of the University.



Agricultural and Food Economics

GRADUATE FACULTY

Jean B. Wyckoff, *Head of the Department of Agricultural and Food Economics and Professor of Agricultural Economics*, B.S., Oregon State, 1953; M.S., 1957; Ph.D., Washington State, 1963.

John H. Bragg, *Associate Professor of Agricultural Economics*, B.S., Maine 1948; M.S., Maine, 1949; D.B.A., Indiana University, 1966.

Robert L. Christensen, *Associate Professor of Agricultural Economics*, B.S., Michigan State, 1958; M.S., Delaware, 1960; Ph.D., North Carolina State, 1967.

Bradford D. Crossmon, *Professor of Agricultural Economics*, B.S., Connecticut, 1937; M.S., 1943; M.P.A., Harvard, 1949; D.P.A., 1963.

N. Eugene Engel, *Associate Professor of Agricultural Economics*, B.S., Nebraska, 1954; M.S., Connecticut, 1959; Ph.D., 1967.

John H. Foster, *Professor of Agricultural Economics*, B.S., Cornell, 1950; M.S., Purdue, 1951; Ph.D., Cornell, 1957.

Earl I. Fuller, *Associate Professor of Agricultural Economics*, B.S., Michigan State, 1955; M.S., 1957; Ph.D., Minnesota, 1965.

Elmar Jarvesoo, *Associate Professor of Agricultural Economics*, M.S., Tartu University, Estonia, 1937; Dr. Agri. Sci., University of Berlin, 1939.

Theodore W. Leed, *Professor of Agricultural Economics*, B.S., Ohio State, 1950; M.S., 1951; Ph.D., 1957.

Sargent Russell, *Professor of Agricultural Economics*, B.S., Maine, 1937; M.S., Cornell, 1939; Ph.D., Massachusetts, 1956.

David A. Storey, *Associate Professor of Agricultural Economics*, B.S., Massachusetts, 1954; M.S., Purdue, 1958; Ph.D., Purdue, 1960.

The Department offers both the Ph.D., and the M.S., degree. A thesis is required for the M.S., degree. General requirements of the Graduate School for the Ph.D., are applicable. The Department requires no foreign language reading competency for the doctoral degree.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. PROBLEMS IN AGRICULTURAL, FOOD AND RESOURCE ECONOMICS.

Independent study and research on selected problems in agricultural, food, and resource economics. *Credit, 3.* Staff.

702. AGRICULTURE IN THE NATIONAL ECONOMY.

The application of economic theory, particularly welfare economics, to the determination of agricultural prices and income. The interdependency of agriculture and other sectors of the economy. Effects on agriculture of national fiscal, and monetary policy. *Credit, 3.* Mr. Engel.

704. ADVANCED ANALYSIS OF FOOD MARKETING SYSTEMS.

Conceptual and normative analysis at both micro- and macro-levels of food and commodity marketing systems. Firm and group behavior, market structure, public policy implications. *Credit, 3.* Mr. Storey.

705. RESEARCH METHODS IN AGRICULTURAL, FOOD AND RESOURCE ECONOMICS.

Scientific method and its application. Selection, planning and conduct of research. Formulation of models and hypotheses. Interdisciplinary considerations. Techniques commonly used and promising new approaches. Research administration.

Credit, 1-3. Mr. Jarvesoo.

721. NATURAL RESOURCE DEVELOPMENT ECONOMICS.

Welfare economics in relation to resource development goals; use of economic models for resource development planning and decision making; problems of evaluating development plans. *Credit, 3.* Mr. Wyckoff.

740. QUANTITATIVE METHODS.

Applications of micro-econometric techniques in agricultural, food and resource economics. Emphasis is put upon practical applications of modern methods of quantitative analysis to problems of the firm.

Credit, 3. Mr. Fuller.

775. ADVANCED AGRICULTURAL AND FOOD ECONOMICS.

Intensive study of the theory of the firm as it applies to agricultural and food production, including: production functions, cost functions, programming, and decision-making principles; the nature of the aggregate supply functions in agriculture; applications of these principles to the agricultural firm and regional resource allocation, and to the distribution of income to and within agriculture.

Prerequisite, permission of instructor.

Credit, 3. Mr. Jarvesoo.

799. SEMINAR. *Credit, 1-3.* Staff.

800. MASTER'S THESIS.

Credit, 6. Staff.

900. DOCTORAL DISSERTATION.

COURSES OPEN TO BOTH GRADUATE AND UNDER-GRADUATE STUDENTS

(For either major or minor credit)

535. AGRICULTURAL BUSINESS MANAGEMENT.

Basic decision making principles, management tools, analytical methods and their application to management problems of commercial farms and other agricultural firms.

Credit, 3. Mr. Lee.

546. ADVANCED MANAGEMENT OF AGRICULTURAL FIRMS.

Application of the theory of the firm and modern decision theory to management of typical agricultural businesses. Plans for alternative firm adjustments will be analyzed using budgeting and other methods.

Credit, 3. Mr. Crossmon.

561. FOOD MARKETING SYSTEMS.

Structure of food marketing systems. Op-

erating principles, significant product characteristics, role of specialized marketing firms, government programs and policies.

Credit, 3. Mr. Fitzpatrick.

565. FOOD MERCHANDISING.

The principles of merchandising food products. Effects of store layout, product location, product mix, methods of display, turnover, pricing, ordering, inventory control, upon sales and profits.

Credit, 3. Mr. Marion.

582. WATER QUALITY ECONOMICS.

Principles for selection of welfare maximizing plans from among alternative pollution control policies and measures. Market and administrative decision making processes for pollution control.

Credit, 3. Mr. Vertrees.

641. PRICE THEORY AND ANALYSIS.

Elements of food and agricultural price making; demand and supply theory and methods of price analysis and forecasting; introduction to econometrics.

Credit, 3. Mr. Russell.

652. AGRICULTURAL POLICY.

Analysis of farm price support programs, programs for alleviation of rural poverty, food trade and aid policies, other topical issues.

Credit, 3. Mr. Storey.

668. FOOD DISTRIBUTION ECONOMICS.

A critical analysis of the food industry; the legal and competitive framework; performance and public policy; management practices with respect to site selection, budgeting, merchandising, expense control and employee training and evaluation in food distribution firms.

Credit, 3. Mr. Leed.

673. RESOURCE AND CONSERVATION ECONOMICS.

Economic and institutional factors affecting land and water use. Land use planning, elements of conservation economics, recreation economics, water and watershed management.

Credit, 3. Mr. Foster.

681. INTERNATIONAL AGRICULTURAL DEVELOPMENT.

Economic development of low income rural economies. Relation of agriculture to national economies. Exogenous and endogenous factors in development.

Credit, 3. Mr. Foster.

Agricultural Engineering

GRADUATE FACULTY

Joe T. Clayton, *Head of the Department of Agricultural Engineering and Professor of Agricultural Engineering*, B.S.A.E., Tennessee, 1949; M.S., Illinois, 1951; Ph.D., Cornell, 1962.

Chin Shu Chen, *Assistant Professor of Agricultural Engineering*, B.S., National Taiwan University, 1960; M.S., Massachusetts, 1965; Ph.D., North Carolina State, 1968.

Tsuan H. Feng, *Professor of Civil and Agricultural Engineering*, B.S.C.E., Peiyang University, China, 1940; M.S.C.E., University of Wisconsin, 1946; Ph.D., 1950.

Gerald A. Fitzgerald, *Professor Emeritus of Agricultural Engineering*, S.B., Massachusetts Institute of Technology, 1923.

Stevenson W. Fletcher, *Assistant Professor of Agricultural Engineering*, B.S., Pennsylvania State, 1960; M.S., 1964; Ph.D., Massachusetts, 1970.

John S. Norton, *Associate Professor of Agricultural Engineering*, B.S., Pennsylvania State, 1948; M.S., Louisiana State 1950.

Chokyun Rha, *Assistant Professor of Agricultural Engineering*, S.B., Massachusetts Institute of Technology, 1962; M.S., 1964; M.S., 1966; Ph.D., 1967.

Lester F. Whitney, *Associate Professor of Agricultural Engineering*, B.S., Maine, 1949; M.S., Michigan State, 1951; Ph.D., 1963.

John W. Zahradnik, *Professor of Agricultural Engineering*, B.S., Pennsylvania State, 1950; M.S., Iowa-State, 1951; Ph.D., M.I.T., 1965.

Graduate programs in agricultural engineering involve studies in the broad area which relate macro-physical and micro-physical environments to biological systems. Options are offered in: (a) agricultural engineering, (b) biological environment engineering, and (c) biological process engineering. Academic backgrounds, as well as programs of study, may differ markedly depending upon the aims of the student and the option selected. Students majoring in any option must possess a strong background in the physical and engineering sciences and have, or be prepared to acquire, a basic knowledge of the biological and/or agricultural sciences.

Requirements for both the M.S. and Ph.D. degrees include courses offered by the department of agricultural engineering and courses in supporting areas, such as mechanical, chemical and civil engineering, mathematics, food science and technology, and the biological and micro-biological sciences. A typical Ph.D. program includes approximately one-third major department offerings, one-third course work in supporting areas, and one-third dissertation. The department requires intermediate level reading knowledge of one foreign language, to be selected from French, German, Russian, English, of all candidates for the doctoral degree.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS.

Credit, 1-6. Staff.

756. ENGINEERING ANALYSIS OF BIOLOGICAL SYSTEMS.

Methods of mathematical modeling as a supplement to laboratory experiments. Analysis of biological problems in an engineering context, and the physical and mathematical interpretation of the results. Non-equilibrium thermodynamics, diffusional processes, and selected mathematical models of biological systems.

Prerequisite, Math 585 or approval of department.

Credit, 3. Mr. Chen.

760. PHYSICAL AND PHYSIOLOGICAL RELATIONSHIPS IN ANIMAL ENVIRONMENTS.

(In cooperation with Department of Veterinary and Animal Sciences)

Functional environment contrasted to the generalized environment. The action of the environment on the animal and the reaction of the animal on the environment in terms of several parameters; radiant energy, light, temperature, atmospheric composition, air flow, ambient pressure, etc. Modification of natural environments to vary physiological response.

Prerequisite, permission of instructor.

Credit, 3. Mr. Clayton, Mr. Mellen.

766. CONTROL OF HEAT AND VAPOR FLOW IN BUILDINGS AND PROCESSES.

Application of mass flow theory to heat and vapor transfer. Thermal and gaseous interchange between animals and biological products and their environments. The application of instruments and controls.

Prerequisite, Mech Eng 582 or equivalent.

Credit, 3. Mr. Clayton.

776. ADVANCED AGRICULTURAL MACHINERY DESIGN.

Feed machinery component design problems will be studied using analysis such as finite difference, energy and graphical methods as well as conventional approaches. The interrelation of the food industry. Shell theory and vessel design will be included. A design problem is required of each student.

Credit, 3. Mr. Whitney.

780. BIOPHYSICS IN AGRICULTURAL ENGINEERING.

The properties of certain living systems in terms of the concepts of physics and engineering; includes the biophysical concept of the living cell; the theory of controlling regimes and biological rate processes; scalar problems pertaining to industrial applications; the instrumentation for kinetic studies involving heat and pressure in biological systems.

Prerequisite, Ag Eng 781.

Credit, 4. Mr. Zahradnik.

781. BIOLOGICAL PROCESS ENGINEERING.

Dimensional analysis and reaction kinetics as applied to pilot plant procedures and the scale-up of biological processes for system design.

Prerequisite, Ag Eng 681.

Credit, 3. Mr. Zahradnik.

786. ADVANCED PROCESS ENGINEERING.

A comparative engineering evaluation and analysis of agricultural product processes including: thermal processing, ionizing radiation processing, freeze drying, dehydration, fermentation and controlled atmospheres.

Credit, 3. Mr. Zahradnik.

791. SEMINAR.

Research methods in Agricultural Engineering.

Credit, 1. Staff.

792. SEMINAR.

Research accomplishments in Agricultural Engineering.

Credit, 1. Staff.

891 a. & b. PROFESSIONAL TOPICS IN AGRICULTURAL ENGINEERING.

Credit, 2 (1 each). Staff.

892 a. & b. TECHNICAL TOPICS IN AGRICULTURAL ENGINEERING.

Credit, 2 (1 each). Staff.

800. MASTER'S THESIS.

Credit, 4-8. Staff.

900. DOCTORAL DISSERTATION.

Credit, 30. Graduate Staff.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

681. ELEMENTS OF FOOD UNIT OPERATIONS.

The fundamental principles of heat transfer, fluid flow, properties of biological materials and psychrometry as applied to the unit operations in food processing, including evaporation, distillation, dehydration, freeze drying, cooling and freezing.

Credit, 3. Mr. Fletcher.

686. APPLICATIONS OF FOOD ENGINEERING.

Engineering concepts related to the processing and distribution of foods.

Prerequisite, Ag Eng 681.

Credit, 3. Mr. Fletcher.

690. INSTRUMENTATION.

Instruments as applied to scientific research: recorders, indicators, controllers and transducers in general. Emphasis on transducers for ten or twelve common variables including temperatures, pressure, humidity and strain. Particular attention to applications and limitations.

Prerequisite, Physics 107 or equivalent.

Credit, 3. Mr. E. Johnson.

Animal Science

GRADUATE FACULTY

Thomas W. Fox, *Head of the Department of Veterinary and Animal Sciences and Professor of Animal Science*, B.S., Massachusetts, 1949; M.S., 1950; Ph.D., Purdue, 1952.

Donald L. Anderson, *Associate Professor of Animal Science*, B.S., Massachusetts, 1950; M.S., Connecticut, 1952; Ph.D., Cornell, 1955.

Donald L. Black, *Professor of Animal Science*, B.S., Maine, 1954; M.S., Cornell, 1957; Ph.D., 1959.

Wallace G. Black, *Professor of Animal Science*, B.S., Wisconsin, 1948; M.S., 1949; Ph.D., 1952.

Anthony Borton, *Associate Professor of Animal Science*, A.B., Haverford College, 1955; M.S., Michigan State, 1961; Ph.D., 1964.

Richard A. Damon, *Professor of Animal Science*, B.S., Massachusetts, 1947; M.S., Minnesota, 1949; Ph.D., 1951.

Robert T. Duby, *Assistant Professor of Animal Science*, B.S., Massachusetts, 1962; M.S., 1965; Ph.D., 1967.

Heinrich Fenner, *Assistant Professor of Animal Science*, B.S., Agricultural College of Stuttgart-Hohenheim, 1951; Ph.D., 1956.

Stanley N. Gaunt, *Professor of Animal Science*, B.S., Rutgers, 1938; Ph.D., North Carolina State, 1955.

George R. Howe, *Associate Professor of Animal Science*, B.S., Vermont, 1957; M.S., Pennsylvania State, 1959; Ph.D., Massachusetts, 1961.

Sidney J. Lyford, *Assistant Professor of Animal Science*, B.S., New Hampshire, 1958; M.S., North Carolina State, 1960; Ph.D., 1964.

William J. Mellen, *Professor of Animal Science*, B.S., Massachusetts, 1949; M.S., Cornell, 1951; Ph.D., 1953.

Olga M. Olesiuk, *Assistant Professor of Veterinary Science*, B.A., Mount Holyoke, 1946; M.S., Massachusetts, 1950.

Martin Sevoian, *Professor of Veterinary Science*, B.S., Massachusetts, 1949; V.M.D., Pennsylvania, 1953; M.S., Cornell, 1954.

Russell E. Smith, *Professor of Veterinary Science*, B.S., Massachusetts, 1938; V.M.D., Pennsylvania, 1942.

J. Robert Smyth, *Professor of Animal Science*, B.S., Maine, 1945; M.S., Purdue, 1947; Ph.D., 1949.

Glenn H. Snoeyenbos, *Professor of Veterinary Science*, D.V.M., Michigan State, 1945.

The graduate program in the animal sciences includes studies in mammalian and avian biology, with options in (a) genetics, (b) physiology, (c) nutrition, and (d) animal diseases. Students planning to major in any one of these fields must have a strong background in biology and chemistry or mathematics, or must be prepared to remedy undergraduate deficiencies without graduate credit. The option in animal diseases is designed primarily for veterinarians, but is open to others with appropriate academic training. Requirements for both the M.S. and Ph.D. degrees include courses in the animal sciences offered by the department and courses in supporting areas offered by

such departments as Zoology, Chemistry, Bio-chemistry, Microbiology, and Statistics. Available research material includes a number of domestic species. The department requires no foreign language reading competency for the doctoral degree.

COURSES OFFERED BY THE DEPARTMENT (Note: 500 and 600 series courses are open to both graduate and undergraduate students; 700 and 800 series are open to graduate students only. Where prerequisites are stated, equivalent courses taken at other institutions or permission of instructor may be substituted.)

Genetics

608. COMPARATIVE ANIMAL GENETICS.

The mechanisms of heredity and variation in livestock and poultry; the role of selection and breeding systems in genetic improvement and their evaluation.

Prerequisite, Zool 540. *Credit, 3.* Mr. Fox.

704. AVIAN GENETICS.

The classical and physiological genetics of morphological traits of avian species. Particular emphasis is given to melanogenesis and characteristics involving epidermal structures.

Prerequisites, one year's training in biology and Zool 540. *Credit, 3.* Mr. Smyth.

705. GENETICS OF PRODUCTIVE TRAITS IN POULTRY.

Lectures and reports on the genetics of meat production and reproduction. Special emphasis is placed on the physiological genetics of fertility and embryogenesis.

Prerequisites, one year's training in biology and Zool 540. *Credit, 2.* Mr. Smyth.

706. QUANTITATIVE INHERITANCE AND SELECTION.

The principles of population genetics and quantitative inheritance as applied to selection for traits of economic importance in poultry; theoretical and practical considerations of breeding systems.

Prerequisites, An Sci 705, or Zool 540, Stat 551. *Credit, 3.* Mr. Fox.

707. ADVANCED ANIMAL GENETICS.

Modern research in animal breeding with emphasis on the statistical approach. Includes development of selection indexes for various farm animals, sire indexes, and breeding plans based on systems of mating and selection.

Prerequisite, An Sci 608.

Credit, 3. Mr. Gaunt.

Physiology

520. ANIMAL PHYSIOLOGY.

Comparative study of the physiology of mammals and birds, with emphasis on those aspects most pertinent to animal science.

Prerequisite, Zool 135.

Credit, 4. Mr. Howe.

621. PHYSIOLOGY OF REPRODUCTION.

Comparative aspects of anatomy, embryology, endocrinology and physiology of reproduction and lactation.

Credit, 4. Mr. W. G. Black.

724. ADVANCED AVIAN PHYSIOLOGY.

Lectures and reports on specific problems in avian physiology.

Prerequisites, Biochem 524, An Sci 520.

Credit, 3. Mr. Mellen.

725. MAMMALIAN REPRODUCTION.

An advanced course emphasizing the comparative approach to problems of reproductive anatomy and endocrinology. Lectures, laboratory and seminar reports with theoretical and practical considerations of current research findings in laboratory and domestic animals, and in primates.

Credit, 3. Mr. D. L. Black.

726. FERTILITY AND FECUNDITY.

The role of heredity, nutrition, pathology and environment in the determination of fertility and fecundity in mammalian forms. Current research directed toward control of reproductive function through experimental means is emphasized.

Prerequisites, An Sci 621 or 725.

Credit, 3. Mr. W. G. Black.

Nutrition

630. PRINCIPLES OF NUTRITION.

Scientific principles of nutrition, emphasizing the basic biochemical and physiological concepts underlying the specific functions and interrelationships of the nutrients required for maintenance, production, and reproduction in both ruminants and non-ruminants. *Credit, 3. Mr. Anderson.*

734. ADVANCED AVIAN NUTRITION.

Lectures, reports and discussions of significant research developments and theories in avian nutrition.

Prerequisites, Chem 562, Biochem 524, An Sci 630. *Credit, 3. Mr. Anderson.*

735. RUMINANT NUTRITION.

An advanced course in ruminant digestion and metabolism. Special topics will be selected and discussed in the light of recent and current research.

Prerequisites, An Sci 630, Biochem 524. *Credit, 3. Mr. Lyford.*

ANIMAL DISEASES (Students holding a medical degree will not be given credit for the following Animal Science courses: 670, Animal Pathology; 772, Mammalian Diseases; 773, Avian Diseases; and 774, Histopathology.)

670. ANIMAL PATHOLOGY.

Introduction to the study of animal diseases; causes, development, transmission, and control. Lectures and demonstrations.

Prerequisites, microbiology and physiology. *Credit, 3. Mr. Smith.*

771. DIAGNOSTIC LABORATORY TECHNIQUES.

Microbiological, histopathological, immunological, hematological techniques applicable to the diagnostic laboratory.

Credit, 2. Staff.

772. MAMMALIAN DISEASES.

A survey of diseases of mammals, including laboratory animals, with emphasis on in-

fectious diseases and their control. Lectures and demonstrations.

Prerequisite, permission of instructor.

Credit, 3. Mr. Harris.

773. AVIAN DISEASES.

Similar to 772, but with emphasis on diseases of birds. Lectures and demonstrations.

Prerequisite, permission of instructor.

Credit, 3. Mr. Snoeyenbos.

774. HISTOPATHOLOGY.

Histologic study of basic pathological processes.

Prerequisites, histology and permission of instructor. *Credit, 3. Mr. Sevoian.*

Miscellaneous

661. INTERMEDIATE BIOMETRY (1)

Design of experiments conducted in the biological sciences. Methods of analysis of such designs, including expectations of mean squares, selection of appropriate error terms, individual and multiple comparisons, and trend analyses.

Prerequisite, introductory course in biometrics, or statistics, such as Statistics 121.

Credit, 3.

662. ADVANCED STATISTICAL ANALYSIS OF EXPERIMENTAL DATA (II)

Analysis of data with disproportionate subclass numbers, including the method of fitting constants, the method of weighted squares of means, absorption of equations, expectations of mean squares, and tests of hypotheses.

Prerequisite, An Sci 661. *Credit, 3.*

700. SPECIAL PROBLEMS

A specific problem in some aspect of animal science not related to the candidate's thesis. *Credit, 1-6. Staff.*

751, 752. SEMINAR.

Credit, 1 each semester. Staff.

Anthropology

GRADUATE FACULTY

Richard B. Woodbury, *Head of the Department and Professor of Anthropology*, B.S., Harvard, 1939; M.A., 1942; Ph.D., 1949.

George J. Armelagos, *Assistant Professor of Anthropology*, B.A., Michigan, 1958; M.A., Colorado, 1963; Ph.D., 1968.

Ralph H. Faulkington, *Assistant Professor of Anthropology*, B.A., Wheaton College, 1965; M.A., Michigan State, 1967; Ph.D., 1970.

David H. Fortier, *Assistant Professor of Anthropology*, B.A., Columbia, 1949; M.A., 1953; Ph.D., 1964.

Thomas M. Fraser, Jr., *Associate Professor of Anthropology*, A.B., Harvard, 1949; M.A., Columbia, 1958; Ph.D., 1963.

Joel M. Halpern, *Professor of Anthropology*, B.A., Michigan, 1950; Ph.D., Columbia, 1956.

William M. Harrison, *Assistant Professor of Anthropology*, B.A., California at Santa Barbara, 1954; Ph.D., Arizona, 1965.

Daniel W. Ingersoll, Jr., *Assistant Professor of Anthropology*, A.B., Harvard, 1966; Ph.D., 1970.

Nancy D. Munn, *Assistant Professor of Anthropology*, B.A., Oklahoma University, 1951; M.A., Indiana, 1955; Ph.D., Australian National University, 1961.

Oriol Pi-Sunyer, *Associate Professor of Anthropology*, B.A., Mexico City College, 1954; M.A., Harvard, 1957; Ph.D., 1962.

Donald A. Proulx, *Assistant Professor of Anthropology*, B.S., Wisconsin at Milwaukee, 1961; Ph.D., California at Berkeley, 1965.

Zdenek Salzmann, *Associate Professor of Anthropology*, M.A., Indiana, 1949; Ph.D., 1963.

ASSOCIATED FIVE-COLLEGE GRADUATE FACULTY

Donald S. Pitkin, *Professor of Anthropology* (Amherst College), A.B., Harvard, 1947; M.A., 1950; Ph.D., 1954.

Students entering graduate work in anthropology are expected to be conversant with the field of anthropology as evidenced by successful undergraduate completion of introductory course work in at least three of the four subfields of anthropology, plus at least two advanced courses. With respect to this requirement, an entering student will be expected to remove any deficiencies before being granted full graduate standing.

Students working toward the Master of Arts degree in anthropology, in addition to fulfilling the general requirements of the Graduate School for the degree, must achieve a mastery of general theory in cultural and social anthropology, and begin developing an area or subfield of specialization. They should also attain familiarity with descriptive linguistics, physical anthropology, and archaeology.

In addition, students must pass an examination in a foreign language, (or "tool of research") and a Master's-level comprehensive examination in anthropology.

In addition to fulfilling general requirements of the Graduate School for the Ph.D. degree, students will be expected to pass with a grade of B or better thirty hours of course work beyond the Master's degree. There are no specific course requirements. Fieldwork will be required of all candidates. It should be in the candidate's area of specialization and should normally be undertaken under the supervision of the candidate's major adviser. This fieldwork is expected to provide the material for the candidate's doctoral dissertation.

The department requires intermediate level reading knowledge of one foreign language of all candidates for the doctoral degree. As an additional departmental requirement, Ph.D. candidates would be required to demonstrate their proficiency in Statistics or Computer Science; how-

ever, in special cases with the approval of the department, a second foreign language could be substituted.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS IN ANTHROPOLOGY.

Directed individual research or reading in Anthropology. *Credit, 1-12.* Staff.

701, 702. SEMINAR.

Each semester a topic will be selected from one or more of the four fields of Anthropology, or pertaining to Anthropology as a whole. Outside speakers will present their research findings to graduate students and faculty in the seminar's context.

Credit, 1 each semester. Staff.

722. ARCHAEOLOGY OF THE SOUTHWEST.

Examination of selected problems in methodology and interpretation of the prehistory of the American Southwest. May be repeated once for credit.

Credit, 3. Mr. Harrison.

725. ANDEAN ARCHAEOLOGY.

Selected problems in excavation, analysis and interpretation of Andean prehistory. Special emphasis on the later stages of development of native American civilizations.

Credit, 3. Mr. Proulx.

765. PROBLEMS IN FAR EASTERN ANTHROPOLOGY.

Detailed consideration of selected, important anthropological problems and controversies in dealing with archaeological and/or cultural anthropological data from the Far East. China is emphasized.

Credit, 3. Mr. Fortier.

767. SOUTHEAST ASIAN ANTHROPOLOGY.

Selected problems in Southeast Asian Anthropology, such as relations between hill and valley cultures, education, economic development and minority group problems will be dealt with in this seminar. Major attention paid to the mainland.

Credit, 3. Mr. Fraser, Mr. Halpern.

770. PROBLEMS IN NORTH

AMERICAN ARCHAEOLOGY.

Selected problems in North American archaeology, emphasizing the anthropological interpretation of prehistoric data.

Credit, 3. Mr. Harrison.

800. MASTER'S THESIS. *Credit, 6-9.*

802. RESEARCH IN ARCHAEOLOGY.

Directed individual research in archaeology. *Credit, 1-12.*

803. RESEARCH IN PHYSICAL ANTHROPOLOGY.

Directed individual research in physical anthropology. *Credit, 1-12.*

804. RESEARCH IN CULTURAL ANTHROPOLOGY.

Directed individual research in cultural anthropology. *Credit, 1-12.*

805. RESEARCH IN LINGUISTIC ANTHROPOLOGY.

Directed individual research in linguistic anthropology. *Credit, 1-12.*

836. INDIVIDUAL AND SOCIETY.

A cross-cultural consideration of the relationship between the individual and his society with attention to theories, methods and empirical findings as reported in the literature of the behavioral sciences.

Credit, 3. Staff.

837. THEORY IN CULTURAL ANTHROPOLOGY.

Theoretical problems which have had a lasting place in anthropological thought; the nature of culture, cultural dynamics and stability, and the transmission of culture as discussed by leading writers.

Credit, 3. Mr. Fortier.

838. CONTEMPORARY ANTHROPOLOGICAL THEORY.

Analysis of selected problems in contemporary anthropological theory with emphasis on the structural approaches of the British and French school.

Credit, 3. Miss Munn.

839. SEMINAR: COMPARATIVE SOCIAL SYSTEMS.

Individual study and discussion of types of

social systems in non-literate and peasant societies; and consideration of relevant anthropological theory.

Credit, 3. Miss Munn.

840. ANTHROPOLOGY AND DEVELOPMENT.

Tribal and traditional economic systems and the process of economic and technological change. Emphasis on current problems of modernizing nations.

Credit, 3. Mr. Pi-Sunyer.

845. REVOLUTION AND SOCIAL CHANGE.

Focusing on drastic social and cultural change. Emphasis on the historical background and social contexts of political revolutions and their role in modernizing nations.

Credit, 3. Mr. Halpern.

850. SEMINAR IN RELIGION AND SYMBOLISM.

Anthropological approaches to the study of religion and ritual within the context of the symbolic system of a culture. Emphasis on theory and the analysis of data.

Credit, 3. Miss Munn.

860. LANGUAGE AND CULTURE.

An interdisciplinary examination of theories of the relationship of language and culture, and the effect of language behavior and linguistic categories on human personality, thought, interaction and custom.

Credit, 3. Mr. Salzmann.

875. METHOD IN CULTURAL ANTHROPOLOGY.

Methods of studying cultures of homogeneous and heterogeneous societies among primitive and modern peoples, with emphasis on the various techniques of field work; observation, interviewing, use of technical devices, content analysis and projective and verbal materials.

Credit, 3. Staff.

880. PHYSICAL ANTHROPOLOGY: THE SKELETON.

The human skeleton considered in its functional aspects and with reference to evolution, race, age, and sex. Methods of osteological investigation and osteometrics.

Credit, 3. Mr. Armelagos.

882. PHYSICAL ANTHROPOLOGY OF THE LIVING.

Techniques and applications of physical anthropology among living persons. Anthropometry, somatotyping, serology and other descriptive methods; elements of statistical analysis. Body form and function in relation to individual constitution and racial variation.

Credit, 3. Mr. Armelagos.

900. DOCTORAL DISSERTATION.

Credit, 30.

ANTHROPOLOGY COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

534. PRIMITIVE ART.

A survey of the cultural and aesthetic aspects of the visual arts of primitive societies in sub-Saharan Africa, Oceania, and North America. Emphasis on the function and meaning of art in society.

Credit, 3. Mrs. Jopling.

555. PRE-INDUSTRIAL TECHNOLOGY.

Analysis of selected aspects of the material culture of simpler societies, both past and present, in relation to social and economic aspects of culture.

Prerequisite, Anthropology 102 or 104.

Credit, 3.

569. CULTURES OF AUSTRALIA AND NEW GUINEA.

The ethnography of aboriginal Australia and New Guinea with emphasis on the particular problems of theory and analysis encountered in these areas.

Credit, 3. Miss Munn.

635. NATIVE AMERICAN LANGUAGES.

A survey of American Indian languages, primarily north of Mexico. Genetic classifications and Sapir's classification based on structural resemblances between language families. Types of linguistic structure and structural restatements. Comparative work and reconstructions.

Credit, 3. Mr. Salzmann.

640. ANTHROPOLOGICAL
PERSPECTIVES ON
RELIGION AND RITUAL.

Classical problems in the anthropology of religion from Durkheim and Tylor to Evans-Pritchard, Levi-Strauss and W. Lloyd Warner. Special attention to the analysis of ritual. *Credit, 3. Miss Munn.*

664. PROBLEMS IN
ANTHROPOLOGY.

Current anthropological thought in regard to specific problems chosen from physical anthropology, archaeology and cultural anthropology.

Prerequisite, permission of instructor.
Credit, 3. Mr. Fraser.

665. WORLD ETHNOGRAPHY.

The current cultures of representative societies from Africa, Oceania, North America, South America, and Asia viewed in relation to historical and environmental influences.

Prerequisite, permission of instructor.
Credit, 3. Mr. Fraser.

667. ETHNOLOGY OF AFRICA.

A limited consideration of the history, physical types, social organization and culture of Africa south of the Sahara with special consideration of several diverse cultures.

Prerequisite, permission of instructor.
Credit, 3. Mr. Faulkington.

668. OLD WORLD PREHISTORY.

A survey of the prehistoric cultures of Europe, Asia, and Africa, with emphasis on the Paleolithic, Neolithic, and early metal-using periods.

Prerequisite, Anth 102 or permission of instructor.
Credit, 3. Mr. Proulx.

669. NORTH AMERICAN
ARCHAEOLOGY.

An intensive survey of American Indian prehistory north of Mexico which will emphasize the historical developmental processes in selected geographical regions.

Prerequisite, Anth 102 or permission of instructor.
Credit, 3. Mr. Harrison.

670. NORTH AMERICAN INDIANS.

Indian tribes with various levels of tech-

nological development and social complexity, from areas north of Mexico, in terms of their environmental context and the impact of non-Indian societies on their cultures.

Prerequisite, Anth 104.

Credit, 3. Mr. Harrison.

673. PEOPLES OF SOUTHEAST
ASIA.

An introduction to the history and ethnography of the native cultures of Southeast Asia, including consideration of the peasant populations and their expanding role Asian states.

Prerequisite, permission of instructor.
Credit, 3. Mr. Fraser.

674. CULTURES OF THE
FAR EAST.

A survey of the culture-history and ethnography of representative peoples of East Asia; peasant sub-cultures of traditional and contemporary China, Japan, and Korea.

Prerequisite, permission of instructor.
Credit, 3. Mr. Fortier

675. SOUTH AMERICAN
ARCHAEOLOGY.

A survey of the pre-Columbian cultures of South America and their development, with special emphasis on the Andean areas.

Prerequisite, Anth 102 or permission of instructor.
Credit, 3. Mr. Proulx

676. THE ETHNOLOGY OF
SOUTH AMERICA.

Analysis of the prehistoric, colonial and contemporary cultures of South America, focusing on the Indian, European and Negro peoples, and how they have related to each other over the past three centuries.

Prerequisite, Anth 104 or permission of instructor.
Credit, 3. Mr. Proulx.

677. SUMMER FIELD SCHOOL
IN ARCHAEOLOGY.

Practical training in archaeology. Prehistoric and Colonial sites will be excavated, and instruction given in archaeological methods and techniques.

Prerequisite, Anth 102 or equivalent.
Credit, 6. Mr. Harrison.

678. THEORY AND METHOD
IN ARCHAEOLOGY.

An intensive examination into the scientific approach to modern archaeological research and the utilization of this approach for deriving and testing theories of prehistory and human behavioral patterns. Prerequisites, Anth 102 and permission of instructor. Credit, 3. Mr. Harrison.

679. CULTURAL DYNAMICS AND
APPLIED ANTHROPOLOGY.

Theories of cultural process and their application to practical cross-cultural situations in administration, technical assistance and community development. Prerequisites, Anth 102 or 104 and permission of instructor. Credit, 3. Mr. Fraser.

680. FIELD COURSE IN CULTURAL
ANTHROPOLOGY.

A summer field course affording the advanced undergraduate or graduate student supervised training in cultural anthropological research. Location varies from year to year. Credit, 6. Staff.

INTERDEPARTMENTAL COURSE
SOCIAL SCIENCE 569. INDIA
AND SOUTH ASIA.

An introductory study of recent political, economic, and social developments in India and the countries of South Asia. Prerequisites, at least two semester courses in one or more of the following fields: Government, Economics, Sociology, Anthropology. Credit, 3. Mr. Driver.

Art

GRADUATE FACULTY

Paul F. Norton, *Head of the Department of Art and Professor of Art*, B.A., Oberlin, 1938; M.F.A., Princeton, 1947; Ph.D., 1952.
Frederick Becker, *Professor of Art*, Otis Art Institute, Los Angeles; Beaux Art Institute of Design, N.Y.C.; Diploma, 1936.
Jack L. Benson, *Professor of Art*, B.A.,

University of Missouri, 1941; M.A., Indiana University, 1947; Ph.D., University of Basel, 1952.
Paul Berube, *Assistant Professor of Art*, B.A., Bowdoin, 1959; B.F.A., Rhode Island School of Design, 1961; M.F.A., Southern California, 1962.
John Coughlin, Jr., *Associate Professor of Art*, B.F.A., Rhode Island School of Design, 1954; M.S., 1961.
John Grillo, *Artist in Residence*, Hartford School of Fine Arts, 1935-1938; California School of Fine Arts, 1946-1947.
Walter Kamys, *Professor of Art*, Diploma, Museum School, Art Institute, Chicago, 1943.
Robert Mallary, *Professor of Art*, Guggenheim Fellow, 1964-1965.
Donald R. Matheson, *Associate Professor of Art*, B.S., United States Military Academy, West Point, N.Y., 1938; M.A., Michigan, 1951.
Lyle N. Perkins, *Professor of Art*, B.F.A., Alfred University, 1939; M.F.A., 1947; Ph.D., Ohio State, 1956.
Carleton Reed, *Professor of Art*, B.S., New York University; M.A., Columbia University, 1947; Ed.D., New York University, 1963.
Mark W. Roskill, *Associate Professor of Art*, B.A., Trinity College, 1956; M.A., Harvard University, 1957; M.A., Trinity College, 1961; M.F.A., Princeton, 1961; Ph.D., Princeton, 1961.
John Roy, *Associate Professor of Art*, B.F.A., 1957; M.F.A., 1959, Yale University.
George Wardlaw, *Associate Professor of Art*, B.F.A., Memphis Academy of Arts, 1951; M.F.A., University of Mississippi, 1954.
James L. Wozniak, *Professor of Art*, B.S., University of Wisconsin, 1954; M.S., University of Wisconsin, 1955; M.F.A., University of Wisconsin, 1958.
The degree of Master of Fine Arts is offered for those interested in the creative aspects of the arts. The degree may be obtained from the Department of Art for

work in the visual arts, or through the Department of English for work in creative writing. Requirements for the degree are listed on page 40.

The degree of Master of Arts in Art History is offered on the successful completion of 30 credits and a written examination. Some of these credits may be courses taken for graduate credit at Amherst, Hampshire, Mount Holyoke, and Smith Colleges.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

Creative Art:

- 700. SPECIAL PROBLEMS. *Credit, 3-12.*
- 701. SPECIAL PROBLEMS:
PAINTING. *Credit, 3-12.*
- 702. SPECIAL PROBLEMS:
PRINTMAKING. *Credit, 3-12.*
- 703. SPECIAL PROBLEMS:
SCULPTURE. *Credit, 3-12.*
- 704. SPECIAL PROBLEMS:
CERAMICS. *Credit, 3-12.*
- 705. SPECIAL PROBLEMS:
DRAWING. *Credit, 3-12.*
- 711. OIL PAINTING. *Credit, 3-12.*
- 721. PRINTMAKING. *Credit, 3-12.*
- 731. SCULPTURE. *Credit, 3-12.*
- 741. CERAMICS. *Credit, 3-12.*
- 800. MASTER'S THESIS. *Credit, up to 18.*

History of Art:

- 706. SPECIAL PROBLEMS:
ART HISTORY. *Credit, 3-12.*
- 714. GREEK PAINTING. *Credit, 3.*
- 715. ROMAN PAINTING. *Credit, 3.*
- 724. PROBLEMS IN ART OF
THE ITALIAN EARLY
RENAISSANCE AND THE
NORTH EUROPEAN LATE
MIDDLE AGES. *Credit, 3.*

- 725. PROBLEMS IN ART OF
THE HIGH RENAISSANCE
TO THE EARLY BAROQUE. *Credit, 3.*

- 734. NINETEENTH CENTURY
PAINTING & SCULPTURE. *Credit, 3.*

- 735. ART SINCE 1880. *Credit, 3.*

- 736. NINETEENTH CENTURY
AMERICAN ARCHITECTURE. *Credit, 3.*

COURSES OPEN TO BOTH GRADUATE AND UNDER-GRADUATE STUDENTS

(For either major or minor credit)

Creative Art:

- 520. PAINTING I.
Easel painting in oil and related media, based on elementary understanding of physical properties of medium, and encouraging individual directions within limitations of sound composition. Six studio hours. *Credit, 3.*
- 522. PAINTING II.
Initial concentration on transparent water color, emphasizing control of techniques and mastery of color relationships. Further experience with opaque water color, such as gouache, casein. Six studio hours. *Credit, 3.*
- 524. PAINTING III.
Continuation of Art 520. Six studio hours. *Credit, 3.*
- 530. ADVANCED DRAWING.
Investigation and development of various techniques and media with special emphasis on figure drawing. Six studio hours. *Credit, 3.*
- 532. ADVANCED DRAWING
PROBLEMS.
Advanced work in traditional and contemporary drawing media. Independent exploration of graphic problems emphasized. Solutions to problems sought in relation to student's personal objectives. Six studio hours. *Credit, 3.*

540. PRINTMAKING, Relief I.

Techniques and aesthetic considerations of the woodblock print and related media. Emphasis on drawing and on understanding technical procedures.

Six studio hours.

Credit, 3.

542. PRINTMAKING, Intaglio I.

Techniques and aesthetic considerations of etching, engraving, aquatint, and related media. Emphasis on drawing and on understanding technical procedures.

Six studio hours.

Credit, 3.

544. PRINTMAKING, Lithography I.

Techniques and aesthetic considerations of making lithographs. Emphasis on drawing and on understanding technical procedures.

Six studio hours.

Credit, 3.

546. PRINTMAKING: Relief II.

Advanced study of materials, techniques and aesthetic considerations relevant to relief printmaking.

Six studio hours.

Credit, 3.

560. SCULPTURE I.

Experimentation with materials. Investigation into the nature of 3-dimensional order. Individual projects.

Six studio hours.

Credit, 3.

562. SCULPTURE II.

Continuation of Art 560.

Six studio hours.

Credit, 3.

580. CERAMICS I.

The designing and making of pottery with the potter's wheel and related tools. A student should have taken one or more basic courses in creative art before this course.

Six studio hours.

Credit, 3.

582. CERAMICS II.

Continuation of Art 580.

Prerequisite, Art 580.

Six studio hours.

Credit, 3.

640. PRINTMAKING: Intaglio II.

Advanced study of materials, techniques, and aesthetic considerations relevant to etching, engraving and aquatint.

Six studio hours.

Credit, 3.

642. PRINTMAKING: Lithography II.

Advanced study of lithography, with particular emphasis on the concepts and techniques of color lithography.

Six studio hours.

Credit, 3.

History of Art:

505. ANCIENT ART AND
ARCHAEOLOGY.

The art of early cultures, mainly in the European region, including Greek and Roman sculpture and painting.

Credit, 3.

525. MEDIAEVAL ART.

Earliest phases of Christian art in catacombs, barbaric influences of northern Europe, Byzantine developments in the East, and the Romanesque and Gothic in the West.

Credit, 3.

545. RENAISSANCE ART.

Painting, sculpture, architecture, with particular attention given to Italian Art. Emphasizes social and historical importance of arts, and changes in style and aesthetic theory.

Credit, 3.

563. AFRICAN ART.

A survey of ancient, traditional and contemporary art and architecture of Western and Central Africa, with emphasis on art in its cultural context.

Credit, 3.

565. BAROQUE ART.

The art of the 17th and early 18th Centuries in Italy, Spain, Germany, France and the Low Countries.

Credit, 3.

571. ART OF INDIA.

The effect of the great Eastern religious movement on art in India and surrounding territories. Some attention to secular art and architecture in modern times.

Credit, 3.

573. THE HINDU TEMPLE.

The conception and development of the Hindu Temple in South and Southeast Asia, with emphasis on the structural traditions of the regions covered.

Credit, 3.

575. CHINESE PAINTING.

Shang tomb paintings, Han, Sung, Yuan, Ming and Ch'ing dynasty art, and the interplay between the art of Japan and the West.

Credit, 3.

577. ART OF BUDDHISM.

The development of Buddhist arts as they spread through Central Asia into East Asia, and as they spread through Southeast Asia. Special consideration to the influence of the changing religion on the arts. *Credit, 3.*

585. EUROPEAN ART, 1780-1880.

Major developments in painting from David to Post-Impressionism in France, England and Germany. *Credit, 3.*

587. MODERN ART, 1880 TO
THE PRESENT.

Emphasis on major artists such as late Cezanne and Gauguin, Picasso, Matisse, Klee, Jackson Pollock, Optical and Pop artists. Main developments of style in relation to these artists. *Credit, 3.*

591. MODERN ARCHITECTURE.

History of the changes in style, technical advances, and aesthetic principles during the past two hundred years. *Credit, 3.*

595. AMERICAN ART.

The earliest Colonial art and architecture, the impact of later European influences; regional art of the late 19th and 20th centuries, and contemporary phases of abstract art. *Credit, 3.*

675, 677. MASTERS OF
WESTERN ART.

An intensive study of the work of a master in the field of art.
Prerequisite, permission of instructor.
1 or 2 class hours. *Credit, 1-2.*

691. SEMINAR IN ROMAN ART.

Origins and development of Roman architecture, portraiture, historical relief, painting and mosaics.
Prerequisites, Art 115 or 505, or Ancient History or permission of instructor.
3 class hours. *Credit, 3.*

693. CRITICISM OF MODERN
ART. (Seminar)

Practical exercises in the evaluation of modern paintings. Discussion of the results.
Credit, 2.

Astronomy

(Five-College Cooperative Program)

GRADUATE FACULTY

William M. Irvine, *Head of the Astronomy Program and Professor of Astronomy*, B.A., Pomona College, 1957; M.A., Harvard, 1958; Ph.D., 1961.

Thomas T. Army, *Associate Professor of Astronomy*, B.A., Haverford, 1961; Ph.D., Arizona, 1965.

Bruce C. Cogan, *Assistant Professor of Astronomy* (Amherst College), B.A., Wooster, 1963; M.S., Michigan, 1964; Ph.D., 1967.

Tom R. Dennis, *Assistant Professor of Astronomy*, (Mount Holyoke College), B.A., University of Michigan, 1963; M.S. (Astronomy), 1964; M.S. (Astro. Sciences), Princeton, 1966; Ph.D., 1970.

William A. Dent, *Assistant Professor of Astronomy*, B.S., Case Institute of Technology, 1960; M.S., University of Michigan, 1962; Ph.D., 1965.

H. Mark Goldenberg, *Associate Professor of Physics*, B.S., California Institute of Technology, 1956; M.S., Harvard, 1957; Ph.D., 1960.

Courtney P. Gordon, *Assistant Professor of Astronomy*, (Hampshire College), B.A., Vassar, 1961; A.M., University of Michigan, 1963; Ph.D., 1967.

Kurtiss J. Gordon, *Assistant Professor of Astronomy* (Hampshire College), B.S., Antioch, 1964; A.M., University of Michigan, 1966; Ph.D., 1969.

Everett M. Hafner, *Dean of the School of Natural Science*, Hampshire College; B.S., Union, 1940; Ph.D., Rochester, 1948.

Edward R. Harrison, *Professor of Astronomy*, Graduate, Institute of Physics, England, 1949; Associate, 1956; Fellow, 1963.

G. Richard Huguenin, *Associate Professor*

of *Astronomy*, S.B., Massachusetts Institute of Technology, 1959; Ph.D., Harvard, 1964.

Robert V. Krotkov, *Associate Professor of Physics*, B.A., Queens University, Canada, 1951; M.S., 1952; Ph.D., Princeton, 1958.

Waltraut C. Seitter, *Professor of Astronomy* (Smith College), M.A., Smith College, 1955; Ph.D., University of Bonn, Germany, 1962.

John D. Strong, *Professor of Astronomy*, B.A., Kansas, 1926; Ph.D., Michigan, 1930.

Joseph H. Taylor, Jr., *Assistant Professor of Astronomy*, B.A., Haverford, 1963; Ph.D., Harvard, 1968.

David J. van Blerkom, *Assistant Professor of Astronomy*, B.S., City College of New York, 1963; Ph.D., Colorado, 1969.

Students entering the Master's and Doctor's programs in astronomy are expected to have a sound background in undergraduate physics. Previous training in astronomy is helpful, but not necessary.

The candidate for a Master's degree will generally take a normal course load during the first year. The second year will be principally devoted to either research directed toward a thesis, or advanced course work. Physics courses shall be included with astronomy courses for determination of the total graduate credits in the major field. If a thesis is offered, at least six credits must be earned in 700-900 series astronomy courses; if a thesis is not offered, twelve credits must be earned in 700-900 series astronomy courses. A general examination must be passed before the degree is awarded.

The general requirements for the Ph.D. in Astronomy are those of the Graduate School. A student takes a normal load of basic courses during the first two years. After passing the qualifying examination, a student will be expected to devote his major effort to research. Research problems may be in either theoretical or observational areas. The basic courses of the program are 643, 644, 730, 740, 741, 743,

744. In addition, students will normally take several courses from Physics 701, 702, 703, 704, 705, 706 and 707. An intermediate level reading knowledge of one foreign language is required of all candidates for the doctoral degree.

COURSES OPEN TO GRADUATE STUDENTS ONLY

700. INDEPENDENT STUDY.

Special study in some branch of astronomy or astrophysics, either theoretical or experimental, under the direction of a faculty member. May be repeated for credit.

Prerequisites, permission of the Head of the Astronomy Program and the faculty member under whose direction the work is to be done
Credit, 1-6.

730. RADIO ASTROPHYSICS.

The physical theory fundamental to Radio Astronomy: propagation of electromagnetic waves in plasma, Faraday rotation, the emission and absorption of synchrotron radiation and bremsstrahlung emission, spectral lines at radio frequencies; nonthermal radio source models.

Prerequisites, Physics 552 and 586.

Credit, 3.

731. RADIO ASTRONOMY.

An introduction to observational radio astronomy. Topics include: a brief survey of areas to which radio observations have made important contributions; antenna systems, interferometers, radiometric systems, and other instrumentation; observing methods and techniques such as lunar occultations.

Prerequisites, Physics 552 and Mathematics 641 or equivalent.

Credit, 3.

740. GALACTIC AND EXTRA-GALACTIC ASTRONOMY.

The stellar density and luminosity functions as applied to the problem of galactic structure. Determination of the galactic force field from stellar motions. Spiral structure, star clusters and their stability.

Prerequisite, Physics 556.

Credit, 3.

741. THE INTERSTELLAR
MEDIUM

Observed properties of the interstellar medium from optical and radio data: composition, distribution and motions. Transfer of dilute radiation and its production in a rarified gas. The dynamics of the gas as influenced by radiation and gravity.

Prerequisites, Astron 644, or permission of instructor. *Credit, 3.*

743. STELLAR ATMOSPHERES.

Theory of stellar atmospheres. Observational methods and observational data, formation of the continuous spectrum, line formation and curve of growth techniques in normal stars, stars with envelopes, variable stars, novae, magnetic fields in stars. Departure from local thermodynamic equilibrium.

Prerequisite, Astron 644. *Credit, 3.*

744. STELLAR STRUCTURE.

Stellar structure and evolution. This course will consider topics in energy generation and transfer in the interior of stars, convective and radiative equilibrium, the computation of stellar models and evolution of young and old stars, red giants, pulsating stars, novae and white dwarfs.

Prerequisites, Astron 643, Comp Sci 409 or equivalent. *Credit, 3.*

745. THE SUN.

The determination of physical conditions in the solar atmosphere using the various observational data. The features of both the quiet and the active sun: granulation, limb darkening, plages, sunspots, etc. Solar-terrestrial relationships.

Prerequisite, Astron 644. *Credit, 3.*

746. SOLAR SYSTEM PHYSICS.

The physics and chemistry of planetary atmospheres, surfaces and interiors. Comets, meteors and asteroids. The solar wind, solar terrestrial relations and the interplanetary medium. Advanced topics in mechanics applicable to astronomical problems.

Prerequisites, Physics 552 and 556 and Astron 644, or permission of instructor.

Credit, 3.

748. COSMOLOGY AND
GENERAL RELATIVITY.

Observational cosmology and cosmological Principles, Background radiation and Olbers' paradox. Newtonian cosmology. General relativity, gravitational waves, relativistic cosmology, and gravitational collapse. Theories of the universe and the origin of celestial structure.

Prerequisite, Physics 585. *Credit, 3.*

797, 798. SEMINAR-REVIEW OF
CURRENT LITERATURE.

Discussion and review of current articles in the astronomical literature. May be repeated for credit. Required of graduate students. *Credit, 1 each semester.*

850. ADVANCED TOPICS IN
ASTRONOMY.

Topics of special interest not currently covered in regular courses.

Prerequisite, permission of instructor.

Credit, 3.

860. SEMINAR ON RESEARCH
TOPICS IN ASTRONOMY.

Topics of current interest not currently covered in regular courses. Instruction via reading assignments and seminars. May be repeated for credit.

Prerequisite, permission of instructor.

Credit, 1-3.

800. MASTER'S THESIS. *Credit, 6.*

900. DOCTORAL DISSERTATION.
Credit, 30.

COURSES OPEN TO BOTH
GRADUATE AND UNDER-
GRADUATE STUDENTS

(For either major or minor credit)

538. TECHNIQUES OF MODERN
ASTRONOMY.

An introduction to modern methods of astronomical observation and data reduction. Specific techniques of optical astronomy, radio astronomy, and space astronomy discussed and analyzed. Laboratory experiments and field observations.

Prerequisite, Physics 113 or 107. *Credit, 3.*

643. ASTROPHYSICS.

Basic topics in astronomy and astrophysics. Observational basis of astrophysics. General principles and the physical state of stellar interiors. Stellar evolution. Interstellar conditions and galactic structure.

Prerequisites, concurrent enrollment in Physics 555. *Credit, 4.*

644. ASTROPHYSICS II.

Interaction of matter and radiation. Radiative transfer. Introduction to the physics of stellar and planetary atmospheres. Interplanetary and interstellar particles. Extraterrestrial radio emission.

Prerequisites, Astron 643 or permission of department. *Credit, 4.*

DIRECTLY RELATED COURSES LISTED UNDER PHYSICS DEPARTMENT:

701. CLASSICAL MECHANICS.

702. STATISTICAL PHYSICS.

703. INTRODUCTORY QUANTUM MECHANICS(I).

704. INTRODUCTORY QUANTUM MECHANICS (II).

705. METHODS OF MATHE- MATICAL PHYSICS.

706. CLASSICAL ELECTRO- DYNAMICS (I).

707. CLASSICAL ELECTRO- DYNAMICS (II).

Biochemistry

GRADUATE FACULTY

Henry N. Little, *Acting Head of the Department of Biochemistry and Professor of Biochemistry*, B.S., Cornell, 1942; M.S., Wisconsin, 1946; Ph.D. 1948.

Anthony M. Gawienowski, *Associate Professor of Biochemistry*, B.A., Villanova, 1948; M.A., Missouri, 1953; Ph.D., 1956.

John H. Nordin, *Assistant Professor of Biochemistry*, B.S., Illinois, 1956; Ph.D., Michigan State, 1961.

Peter Parsons, *Assistant Professor of Biochemistry*, A.B., Colby, 1955; Ph.D., Pittsburgh, 1963.

Trevor Robinson, *Associate Professor of Biochemistry*, A.B., Harvard, 1950; A.M., 1951; M.S., Massachusetts, 1953; Ph.D., Cornell, 1956.

Edward W. Westhead, *Associate Professor of Biochemistry*, B.S., Haverford, 1951; M.S., 1952; Ph.D., Brooklyn Polytechnic, 1955.

ASSOCIATED FIVE- COLLEGE FACULTY

Jytte M. Muus, *Mary Lyon Professor of Biochemistry*, (Mount Holyoke College), Mag. Scient., University of Copenhagen, 1930.

UNIVERSITY OF MASSA- CHUSETTS/BOSTON GRADUATE FACULTY

Martha Bethell, *Assistant Professor of Biology*, B.A., University of Rochester, 1962; Ph.D., Brandeis University, 1967.

Stuart Bradford, *Assistant Professor of Biology*, B.S., Michigan State University, 1957; M.S., 1960; Ph.D., Washington University (St. Louis), 1965.

Herbert Lipke, *Professor of Biology*, B.S., Cornell, 1947; M.S., 1948; Ph.D., University of Illinois, 1953.

The requirements for the M.S. degree in Biochemistry are the general University requirements listed on page 38 of this catalog. All students are required to complete an experimental thesis.

Requirements for the Ph.D. candidate are flexible and will be set by the student's advisory committee in consultation with the student. All candidates for the Ph.D. in Biochemistry are required to develop a minor competence in some closely related field of chemistry or biology.

The department requires that all candidates for the doctoral degree pass a departmental examination, showing reading

knowledge of German, Russian, or French, sufficient to understand journal material.

COURSES OPEN TO GRADUATE STUDENTS ONLY

724. SPECIAL TOPICS IN BIOCHEMISTRY.

Topics of current interest which may include hormones, lipids, carbohydrates, control mechanisms, and protein synthesis.

Prerequisite, Biochem 524.

Credit, 3. Staff.

725. ADVANCED BIOCHEMICAL TECHNIQUES.

A laboratory course to provide experience in the isolation, identification, and analysis of biochemical compounds.

Prerequisites, Biochem 524, and either 525-526 or 527 or equivalent.

Credit, 2-5. Staff.

726. EXPERIMENTAL ENZYMOLOGY.

A laboratory course designed to give experience in the preparation, assay, and physical characterization of enzymes.

Prerequisite, Biochem 525-526.

Credit, 2. Staff.

728. PROTEIN PHYSICAL CHEMISTRY.

(Chemistry course, cross-listed here)

The chemical, physical and biological properties of proteins.

Prerequisites, Biochem 524 and Chem 586.

Credit, 3. Mr. Brandts.

729. ENZYMES.

Basic aspects of enzyme assay, preparation, kinetics, and properties. Topics of current importance such as studies on active sites, mechanisms, and controls of enzyme action.

Prerequisite, Biochem 524.

Credit, 3. Staff.

731. PLANT BIOCHEMISTRY.

The chemistry and metabolism of plants with particular emphasis on higher plants.

Topics such as nitrogen metabolism, photosynthesis, and the chemistry of compounds peculiar to plants.

Prerequisite, Biochem 524.

Credit, 3. Mr. Robinson.

891. SEMINAR.

Required of all students. Oral report on a topic of current interest and preparation of a research proposal based on the seminar topic.

Credit, 1 each semester. Staff.

800. MASTER'S THESIS. *Credit, 10.*

900. DOCTORAL DISSERTATION.

Credit, 30.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

523, 524. GENERAL BIOCHEMISTRY.

A broad introduction to the general field of biochemistry for students majoring in chemistry or in the biological sciences, and a background for more advanced or specialized study in this field. Three class hours, second semester requires one semester of physical chemistry.

Prerequisites, Chem 166 or equivalent. Second semester requires Chem 281 or equivalent.

Credit, 3 each semester. Staff.

525, 526. BIOCHEMISTRY LABORATORY.

The first semester provides experience in working with biochemical materials and familiarity with standard biochemical techniques. The second semester gives the student opportunities to do more sophisticated experiments with an increased opportunity for initiative in experimental design. Density gradient ultracentrifugation, amino acid and peptide analysis, and separation and study of subcellular components will be performed.

Prerequisite, Chem 127 or equivalent.

Credit, 1 each semester. Staff.

527. (1) BIOCHEMISTRY LABORATORY FOR MAJORS.

Similar to 525, 526 but concentrated into one semester and taught at a more advanced level.

Credit, 2.

COURSES NOT FOR MAJOR CREDIT

(No graduate credit for students majoring in Biochemistry)

520. ELEMENTARY BIO- CHEMISTRY.

The more important facts relating to biological materials and processes. Designed primarily for students not eligible for courses 523 or 524. Not open to chemistry or biochemistry majors. Three class hours, one 3-hour laboratory period.

Credit, 4. Mr. Robinson.

Botany

GRADUATE FACULTY

Otto L. Stein, *Head of the Department and Professor of Botany*, B.S., Minnesota, 1949; M.S., 1952; Ph.D., 1954.

David W. Bierhorst, *Professor of Botany*, B.S., Tulane University, 1947; M.S., 1949; Ph.D., University of Minnesota, 1952.

Howard E. Bigelow, *Associate Professor of Botany*, B.A., Oberlin, 1949; M.A., 1951; Ph.D., Michigan, 1956.

Margaret E. Barr Bigelow, *Assistant Professor of Botany*, B.A., University of British Columbia, 1950; M.A., 1952; Ph.D., Michigan, 1956.

Edward L. Davis, *Associate Professor of Botany*, B.A., Harvard, 1951; M.S., Massachusetts, 1953; Ph.D., Washington University, 1956.

Sara A. Fultz, *Assistant Professor of Botany*, B.S., Purdue, 1951; M.S., Michigan, 1953; Ph.D., 1965.

Arthur C. Gentile, *Associate Dean of the Graduate School and Professor of Botany*, B.S., City College of New York, 1948; M.S., Brown, 1951; Ph.D., Chicago, 1953.

Edward J. Klekowski, Jr., *Assistant Professor of Botany*, B.S., N.C. State University, 1962; M.S., 1964; Ph.D., University of California, Berkeley, 1968.

Robert B. Livingston, *Associate Dean of the College of Arts and Sciences and Professor of Botany*, A.B., Colorado College, 1938; M.A., Duke, 1941; Ph.D., 1947.

James A. Lockhart, *Professor of Botany*, B.S., Michigan State, 1949; M.S., 1952; Ph.D., University of California at Los Angeles, 1954.

David L. Mulcahy, *Assistant Professor of Botany*, A.B., Dartmouth College, 1959; Ph.D., Vanderbilt University, 1963.

John R. Rowley, *Associate Professor of Botany*, A.B., California, Los Angeles, 1950; M.A., Oregon, 1953; Ph.D., Minnesota, 1957. On leave 1969–1972.

Rudolf M. Schuster, *Professor of Botany*, B.S., Cornell, 1945; M.S., 1946; Ph.D., Minnesota, 1948.

Seymour Shapiro, *Professor of Botany*, B.S., Michigan, 1947; Ph.D., 1953.

Albert C. Smith, *Ray Ethan Torrey Professor of Botany*, A.B., Columbia University, 1926; Ph.D., Columbia University, 1933.

Arthur I. Stern, *Associate Professor of Botany*, B.S., City College of New York, 1953; Ph.D., Brandeis University, 1962.

Oswald Tippo, *Chancellor of the University and Professor of Botany*, B.S., Massachusetts, 1932; M.A., Harvard, 1933; Ph.D., 1937.

Peter L. Webster, *Assistant Professor of Botany*, B.Sc., University of St. Andrews, 1964; Ph.D., Western Reserve University, 1968.

Robert T. Wilce, *Associate Professor of Botany*, B.S., University of Scranton, 1950; M.S., Vermont, 1952; Ph.D., Michigan, 1957.

ASSOCIATED FIVE-COLLEGE GRADUATE FACULTY

C. John Burk, *Associate Professor of Botany*, (Smith College), A.B., Miami University (Ohio), 1957; M.A., University of North Carolina, 1959; Ph.D., 1961.

Douglas A. Fisher, *Assistant Professor of Botany*, (Mount Holyoke College), B.A., Wabash College, 1954; Ph.D., University of California (Davis), 1968.

David A. Haskell, *Assistant Professor of Botany*, (Smith College), B.Sc., Ohio State, 1951; M.S., Purdue, 1957; Ph.D., 1960.

Sanat K. Majunder, *Assistant Professor of Botany*, (Smith College), B.Sc., Calcutta University, 1949; Ph.D., New Hampshire, 1958.

Henry T. Yost, Jr., *Professor of Biology*, (Amherst College), A.B., The Johns Hopkins University, 1947; Ph.D., 1951.

UNIVERSITY OF MASSACHUSETTS/BOSTON GRADUATE FACULTY

John A. Freeberg, *Associate Professor of Biology*, A.B., Harvard, 1954; A.M., 1957; Ph.D., 1957.

Lawrence Kaplan, *Professor of Biology*, B.A., State University of Iowa, 1949; M.S., 1951; Ph.D., University of Chicago, 1956.

Fuad M. Safwat, *Assistant Professor of Biology*, B.S., University of Baghdad, 1953; A.M., Washington University, 1960; Ph.D., 1962.

Candidates for the Degree of Master of Arts and for the Degree of Doctor of Philosophy are accepted for admission under the general regulations of the Graduate School. Admission to advanced courses does not imply admission to candidacy for an advanced degree. Only students whose knowledge of botany and related chemical and physical sciences is considered by the Department to be adequate will be accepted as candidates for advanced degrees. Research work leading to the thesis may be selected from the fields of anatomy, cytology, ecology, morphology, morphogenesis, physiology, and taxonomy.

The Botany Department normally requires candidates for the Ph.D. degree to demonstrate on the intermediate level

reading knowledge of two foreign languages, one of which must be German. Choice of the second language will be made by consultation of the student with his guidance committee. Waiving of the requirement for the second language may be made by consultation of the student with his guidance committee and must be approved by the departmental Degree Requirements Committee.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS.

Research not expected to terminate in a thesis; advanced study in special subjects.

Credit, 1-5 each semester. Staff.

711, 712. ADVANCED PLANT PHYSIOLOGY.

Selected topics in plant physiology.

Lectures, laboratory, and individual conferences.

Prerequisites, Botany 511, 512 and one semester of Organic Chemistry.

Credit, 2-4 each semester.

Mr. Lockhart, Miss Fultz, Mr. Stern.

715. PLANT GROWTH REGULATORS.

The more recent advances in the field of plant growth regulators; including phytochrome, auxins, gibberellins, kinins, and herbicides. Investigations designed to elucidate the mechanisms whereby these materials control plant growth and development. Possible experimental approaches to the problems.

Prerequisites, Botany 511, and one semester of biochemistry.

Credit, 3. Mr. Lockhart, Mr. Marsh.

721. ADVANCED PLANT ECOLOGY.

Lectures, conferences, critical reading and reports on advanced considerations of synecology and autecology.

Prerequisite, Botany 521.

Credit, 3. Mr. Livingston, Mr. Schuster.

731. ADVANCED MYCOLOGY.

Systematics and ecology of the higher as-

comycetes and basidiomycetes; problems in growth and nutrition of fungi.

Prerequisite, Botany 531 or equivalent.

Credit, 3.

Mr. H. E. Bigelow, Mrs. M. E. B. Bigelow.

741. ADVANCED PHYCOLOGY.

Detailed study of marine and fresh-water algae with emphasis on phylogeny, life, histories and ecology.

Prerequisite, Botany 541 or equivalent.

Credit, 3. Mr. Wilce.

750. PLANT PHOTOSYNTHESIS.

Lectures and discussions of the mechanisms, requirements, evolution, and specific processes related to photosynthesis. An extensive study of the literature contributing to the basic knowledge of photosynthesis. Prerequisite, Botany 512 or Chem 524 or equivalent.

Credit, 3. Mr. Stern, Mr. Marsh.

781. ADVANCED ANGIOSPERM SYSTEMATICS.

Consideration of angiosperm systematics and evolution at an advanced level. Topics may vary from year to year. May be repeated with permission of instructor. Three class hours, one 3-hour laboratory-discussion period.

Prerequisite, Botany 528 and Botany 581, or permission of the instructor.

Credit, 4. Mr. Walker.

800. MASTER'S THESIS.

Maximum credit, 10.

801. ADVANCED PLANT MORPHOGENESIS.

Lectures, discussions and reading on the development of the plant body.

Prerequisites, Botany 591 or 581, Botany 511 or equivalent.

Credit, 3. Mr. Shapiro, Mr. Stein.

821. FOSSIL TRACHEOPHYTES.

Detailed study of anatomy and reproductive histology of those fossil forms which best represent the phylogeny of vascular plants.

Credit, 3.

825. PALYNOLOGY.

Development and comparative morphology of contemporary pollen grains and spores.

Description and/or identification of modern and fossil pollen and spores with attendant laboratory and field techniques. Application of palynology in research, industry, and public health.

Credit, 3. Mr. Rowley.

850. SEMINAR.

Credit, 1 each semester.

Maximum credit, 6. Staff.

900. DOCTORAL DISSERTATION.

BOTANY

COURSES OPEN TO BOTH GRADUATE AND UNDER-GRADUATE STUDENTS

(For either major or minor credit)

511. INTRODUCTORY PLANT PHYSIOLOGY.

Plant processes and their relation to the complex of activity constituting plant growth. Topics include water relations, photosynthesis, fat and protein synthesis, digestion, translocation and respiration.

Prerequisite, 1 semester organic chemistry.

Credit, 4.

Mr. Gentile, Mr. Stern, Mr. Lockhart.

512. PLANT METABOLISM.

The chemical operation of plants, emphasizing the enzymatic processes involved in the synthesis and breakdown of the more important chemical constituents of plants. Prerequisite, Botany 511.

Credit, 4. Mr. Stern, Mr. Marsh.

515. PLANT GROWTH.

The physiology, kinetics and energetics of plant growth. The growth of plant cells, whole plants, assemblages of plants, and plant productivity.

Prerequisites, Botany 211, one year of introductory chemistry, and one year of introductory physics. Courses in differential calculus, statistics, and/or biochemistry are recommended.

Credit, 3.

521. PLANT ECOLOGY.

Interrelationships between plants and their environment, with emphasis on the structure and development of plant communities

Credit, 3. Mr. Mulcahy.

522. AUTECOLOGY.

Plant behavior in relation to the physical and biological environment, with emphasis on the ecology of individual plants.

Prerequisites, Botany 511 and 521.

Credit, 3. Mr. Godfrey, Mr. Mulcahy.

526. PLANT GEOGRAPHY.

Principles governing the development and natural distribution of plants and plant communities with special consideration of the vegetation of North America.

Prerequisite, Botany 521.

Credit, 3. Mr. Livingston, Mr. Schuster.

528. GENECOLOGY.

Ecological phenomena through the application of genetic concepts. The adaptation of individuals, populations, and communities as functional units.

Prerequisite, Botany 240 or Zool 240.

Credit, 3. Mr. Mulcahy.

531. GENERAL MYCOLOGY.

Survey of the various fungi, their life history and distribution, their significance in disease, their utilization by man.

Credit, 3. Mr. Bigelow.

541. PHYCOLOGY.

The phylogeny, taxonomy, morphology and ecology of the major groups of the marine and fresh water algae. Includes field work in both marine and fresh water environments.

Credit, 3. Mr. Wilce.

551. THE ARCHEGONIATES.

The morphology, evolution and systematics of bryophytes, ferns and their allies.

Credit, 3. Mr. Schuster.

555. EXPERIMENTAL
PTERIDOLOGY.

Many of the known physiological and genetical parameters of the pteridophyte life cycle integrated to give an overall view of the biology of these plants. The research potential of these organisms is stressed.

Prerequisites, Botany 240 or Zool 240, and Botany 211.

Credit, 3. Mr. Klekowski.

561. BIOLOGY OF LOWER
PLANTS.

The use of fungi and algae as experimen-

tal organisms for investigations in physiology and genetics.

Prerequisite, Botany 511, Zool 660, or Chem 524.

Credit, 4. Miss Fultz.

570. CYTOGENETICS.

The correlation of genetic data with chromosome behavior, including an analysis of the mechanism of crossing over. Evolutionary considerations of changes in chromosome structure and number.

Prerequisites, Zool 540 and a cytology course preferred.

Credit, 3.

581. THE ANGIOSPERMS.

The evolution and systematics of flowering plants, emphasizing families and their relationships.

Credit, 3. Mr. Schuster.

591. PLANT ANATOMY AND
HISTOLOGICAL METHODS.

Origin and structure of vegetative and reproductive organs of seed plants coordinated with exercises in preparation of stained slides for microscopic studies.

Credit, 4.

601. MORPHOGENESIS.

Development of form and structure at the level of cellular differentiation.

Credit, 3. Mr. Davis.

603, 604. PLANT MORPHOLOGY.

The life cycles of various plant taxa, the dynamics of their evolution and the interpretation of various morphological structures.

Prerequisite, Botany 100 or permission of instructor.

Credit, 4. Mr. Bierhorst.

611. DEVELOPMENTAL PLANT
CYTOLOGY.

Development of plant cell walls, plastids and mitochondria; introduction to fine structure of cytoplasmic and nuclear components and ontogenetic and phylogenetic development of plant cell structures.

Credit, 3. Mr. Webster, Mr. Stein.

COURSES NOT FOR MAJOR
CREDIT

635. AQUATIC VASCULAR
PLANTS.

Systematics, ecology and fundamental im-

portance of aquatic plants. For majors in Wildlife.

Prerequisites, Botany 100, 126. 2 3-hour class-laboratory periods.

Credit, 3. Mr. Ahles, Dr. Wilce.

Business Administration

GRADUATE FACULTY

Wendell R. Smith, *Dean of the School of Business Administration and Professor of Business Administration*. B.Sc., State University of Iowa, 1932; M.A., 1935; Ph.D., 1941.

John W. Anderson, *Professor of Accounting*, B.S., Indiana, 1949; M.B.A., 1953; C.P.A., Maine, 1952; C.P.A., Massachusetts, 1959.

Morton Backer, *Professor of Accounting*, B.B.A., Boston University, 1939; M.Lt., University of Pittsburgh, 1950; Ph.D., 1958; C.P.A., New York and West Virginia, 1941.

Joseph L. Balintfy, *Professor of General Business and Finance*, Dipl. Eng., University of Technical Sciences, Budapest, 1946; Dipl. Economics, 1948; D. Eng., Johns Hopkins University, 1962.

Alexander Barges, *Associate Professor of General Business and Finance*, B.S., University of California, 1956; M.B.A., Northwestern University, 1957; Ph.D., 1962.

Meyer W. Belovicz, *Assistant Professor of General Business and Finance*, B.S., 1961; Illinois Institute of Technology, M.B.A., Northwestern University, 1963; Ph.D., 1967.

Arthur E. Carlisle, *Associate Professor of Management*, B.A., McGill, 1948; M.B.A., Michigan, 1963; Ph.D., 1966.

Gordon K. C. Chen, *Associate Professor of Management*, B.S., Great China University, 1945; M.A., University of Iowa, 1950; Ph.D., 1956.

Pao L. Cheng, *Professor of General Business and Finance*, B.S., National Chiao-tung, China, 1944; M.A., Missouri, 1949; Ph.D., Wisconsin, 1956.

Sidney J. Claunch, *Associate Professor of Management*, A.B., Ohio, 1949; M.B.A., Wisconsin, 1951; Ph.D., 1958.

John T. Conlon, *Associate Dean and Professor of Management*, B.B.A., Massachusetts, 1949; M.A., Connecticut, 1951; Ph.D., Michigan State, 1960.

A. Wayne Corcoran, *Professor of Accounting*, B.S., Cornell University, 1954; M.S., University of Rochester, 1960; C.P.A., State University of New York, 1960; Ph.D., State University of New York at Buffalo, 1966.

M. King Deets, *Assistant Professor of General Business and Finance*, B.A., University of Iowa, 1961; M.A., 1963; Ph.D., 1968.

Carl Dennler, Jr., *Chairman of the Department of Accounting and Professor of Accounting*, B.S., University of Missouri, 1948; M.A., 1950; Ph.D., Wisconsin, 1962.

Arthur Elkins, *Associate Professor of Management*, B.B.A., Massachusetts, 1957; M.S., Columbia, 1958; D.B.A., Indiana, 1967.

Frederick E. Finch, *Assistant Professor of Management*, B.S., Kent State University, 1961; M.B.A., 1963; D.B.A., University of Washington, 1966.

Donald G. Frederick, *Associate Professor of Marketing*, B.S., Indiana University, 1957; M.B.A., 1958; D.B.A., Washington University, 1964.

M. William Frey, *Associate Professor of Management*, B.S., Pennsylvania State, 1956; M.A., Connecticut, 1957; Ph.D., Pennsylvania State, 1963.

Van Court Hare, Jr., *Professor of Management*, B.S., Massachusetts Institute of Technology, 1950; M.A., Columbia, 1953; Ph.D., 1961.

H. Richard Hartzler, *Associate Professor of General Business and Finance*, A.B., Indiana University, 1950; J.D., 1955.

Eugene E. Kaczka, *Associate Professor of General Business and Finance*, B.S., Rensselaer Polytechnic Institute, 1960; M.S., 1961; Ph.D., 1966.

Anthony T. Krzystofik, *Associate Professor of Accounting*, B.S., American International College, 1952; M.A., University of Connecticut, 1961; C.P.A., Massachusetts, 1956.

Robert W. Lentilhon, *Professor of Accounting*, B.S., Rhode Island, 1949; C.P.A., Massachusetts; M.B.A., Boston University, 1953.

James B. Ludtke, *Chairman of the Department of General Business and Finance and Professor of General Business and Finance*, B.A., State University of Iowa, 1947; M.A., 1948; Ph.D., 1951.

Robert E. McGarrah, *Director of the Center for Business and Economic Research and Professor of Management*, S.B., Lafayette College, 1943; S.M., Princeton University, 1948; Ph.D., Cornell University, 1951.

Stephen R. Michael, *Associate Professor of Management*, A.B., Rutgers University, 1948; A.M., Harvard University, 1949; Ph.D., Columbia University, 1967.

Kent B. Monroe, *Assistant Professor of Marketing*, B.A., Kalamazoo College, 1960; M.B.A., Indiana University, 1961; D.B.A., University of Illinois, 1968.

Thomas A. Morrison, *Associate Professor of Accounting*, B.B.A., University of Massachusetts, 1955; M.B.A., Pennsylvania State University, 1962; Ph.D., 1967; C.P.A., Massachusetts.

Walter G. O'Donnell, *Professor of Management*, LL.B., John Marshall Law School, 1930; B.A., Western Reserve, 1932; M.A., 1943; Ph.D., Columbia, 1959.

Grant M. Osborn, *Professor of General Business and Finance*, B.S., Brigham Young University, 1948; M.B.A., Stanford University, 1950; Ph.D., University of Pennsylvania, 1955.

Gordon W. Paul, *Assistant Professor of Marketing*, B.S., University of Tulsa, 1955; M.B.A., University of Texas, 1962; Ph.D., Michigan State University, 1966.

Robert H. Plattner, *Assistant Professor of General Business and Finance*, B.S., University of Missouri, 1950; M.B.A., Ohio

State University, 1962; Ph.D., University of Michigan, 1968.

Robert L. Rivers, *Associate Professor of General Business and Finance*, A.B., Clark University, 1943; M.S., Illinois, 1947; Ph.D., 1957.

George Schwartz, *Associate Professor of Marketing*, B.A., Brooklyn College, 1943; Ph.D., Pennsylvania, 1960.

Isidore Silver, *Associate Professor of General Business and Finance*, B.S., University of Wisconsin, 1955; M.A., New York University, 1965; LL.B., 1959.

George B. Simmons, *Chairman of Department of Management, and Professor of Management*, B.A., University of Louisville, 1953; M.B.A., Indiana University, 1957; D.B.A., 1961.

Richard H. Simpson, *Associate Professor of Accounting*, B.B.A., University of Massachusetts, 1958; M.B.A., University of North Carolina, 1961; Ph.D., 1967; C.P.A., North Carolina, 1964.

Frank A. Singer, *Professor of Accounting*, B.S., Indiana, 1948; M.B.A., 1949; D.B.A., 1955.

Donald E. Stone, *Associate Professor of Accounting*, B.S., Lehigh University, 1961; M.B.A., University of Wisconsin, 1962; Ph.D., 1965; C.P.A., Wisconsin, 1965.

Meenakshisunder Venkatesan, *Associate Professor of Marketing*, B. Com., Bihar (India) University, 1959; M.S., University of Minnesota, 1962; Ph.D., 1965.

Jack S. Wolf, *Chairman of Department of Marketing and Professor of Marketing*, B.A., Coe College, 1949; M.B.A., Wharton, 1950; Ph.D., State University of Iowa, 1957.

Max S. Wortman, Jr., *Professor of Management*, B.S., Iowa, 1956; Ph.D., Minnesota, 1962.

Stanley Young, *Professor of Management*, B.A., Washington University, 1949; M.B.A., Pennsylvania, 1951; Ph.D., 1956.

GENERAL

The program of graduate courses in business administration is designed to prepare

students for positions of responsibility in business, in organizations that serve business, in government, and in related fields of teaching.

The School of Business Administration is an accredited member of the American Association of Collegiate Schools of Business.

PROGRAM ABLE

A special 15-month program, Program ABLE is designed for members of minority groups who are currently employed in work situations where they have demonstrated potential for upper management responsibility. It begins with an intensive 12-week summer session and is followed by entrance into the regular M.B.A. or any of the M.S. programs of the school. Inquiries for brochures and other information concerning Program ABLE should be directed to Dr. Lawrence Johnson, Assistant Dean.

MASTER OF BUSINESS ADMINISTRATION

1. Candidates for the degree of Master of Business Administration must satisfactorily complete 30 semester hours of approved graduate work provided such students have completed their undergraduate degree with a major in Business Administration.

2. For those students who do not hold an undergraduate degree in Business Administration the School shall determine what courses will constitute adequate preparation up to a maximum of 30 additional credits.

3. Permission to present a thesis may be granted to qualified candidates. For such students, an oral rather than a written general examination is required. The thesis proposal must be approved by the end of the first semester. Nine credit hours in lieu of course credit is allowed for a thesis.

4. Non-thesis candidates shall be required to pass a written comprehensive examination.

5. Applicants for admission are required to take the Admission Test for Graduate Study in Business given each year by the Educational Testing Service of Princeton, N.J., to which applicants should write for further information.

6. Twenty-four credit hours of the 30 advanced credits required for the M.B.A. degree must be in courses designed exclusively for graduate students.

7. Graduate Assistants register for a maximum of 12 credit hours each semester. Generally, Graduate Assistants complete their courses during a summer session period following a spring semester.

M.B.A. COURSES

(Courses numbered in the 400 series are reserved for graduate students who are completing prerequisite deficiencies, and do not carry graduate degree credit.)

400. COMPUTER METHODS FOR BUSINESS.

Current and potential management usage of computers, basic computer programming and computer-based information systems in management decision making.

Credit, 3. Staff.

406. BUSINESS FINANCE.

Survey of principles and practices of financing business. Not open to students with undergraduate work in corporation finance. Prerequisite, elementary accounting (through corporate accounts).

Credit, 3. Staff.

411. INTRODUCTION TO ACCOUNTING.

Introduction to principles underlying preparation of financial statements and the development and application of accounting data for planning and control.

Credit, 3. Staff.

422. MARKETING ENVIRONMENT.

Dimensions of change in social, economic and political factors are related to efforts surrounding establishment and attainment of marketing policy and corporate objectives.

Credit, 3. Staff.

440. MANAGERIAL ECONOMICS.

Micro-economic analysis and application to business decisions such as: cost and profit analysis; demand and pricing; investment analysis and capital budgeting; and economic forecasting. *Credit, 3. Staff.*

447. LAW AND GOVERNMENT.

An introduction to nature, functions and limitations of state and non-state law-government systems, industrial jurisprudence and politico-legal environment of business. *Credit, 3. Staff.*

451. ADMINISTRATIVE BEHAVIOR.

Analysis of fundamental psychological and sociological phenomena that underlie group behavior; exploration of organization processes including leadership, communication and change; analysis of classical decision and system theory. *Credit, 3. Staff.*

456. QUANTITATIVE METHODS I.

Business applications of algebra including ratios, proportions, logarithms, partial fraction, series, limits, convergence, combinations, and permutations. Basic concepts of differential and integral calculus. Discrete and continuous probability. *Credit, 3. Staff.*

457. QUANTITATIVE METHODS II.

Laws and theories of probability and statistics, with applications in business and economics. Topics include probability models, sampling distribution, estimation, hypothesis testing, and decision theory. *Credit, 3. Staff.*

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

M.B.A. COURSES

Courses BA 706, 711, 722, 742, 751, 752, 756, and 799 are required of all students who expect to receive the M.B.A. degree.

700. PROBLEMS IN BUSINESS ADMINISTRATION.

Independent study and research on selected problems in Business Administration.

Permission of instructor and the dean required. *Credit, 3-6 each semester. Staff.*

706. FINANCIAL MANAGEMENT.

Internal financial problems of firms: capital budgeting, cost of capital, dividend policy, rate of return and the financial aspects of growth. Readings and cases. *Credit, 3. Mr. Barges, Mr. Ludtke.*

711. ACCOUNTING IN MANAGEMENT.

Production and use of accounting and other quantitative data for decision-making related to planning and control. *Credit, 3. Staff.*

712. ADVANCED MANAGERIAL ACCOUNTING.

An advanced course in the use of accounting and other quantitative measurements for business planning, decision making, and performance evaluation.

Prerequisite, Accounting in Management or permission of instructor. *Credit, 3. Mr. Morrison.*

722. MARKETING MANAGEMENT.

Marketing concepts of planning, organization, control and decision-making from viewpoint of business executive. Tools available for analysis and control of marketing activities are stressed. *Credit, 3. Mr. Paul.*

724. RESEARCH AND DECISION MAKING METHODS IN MARKETING.

Applicability and utilization of quantitative research techniques to marketing problems and processes.

Prerequisites, BA 722 and 756. *Credit, 3.*

Mr. Frederick, Mr. Venkatesan.

726. INTERNATIONAL MAR- KETING MANAGEMENT.

The impact of political, social, economic and cultural forces of divergent societies upon the managerial decision making process in international marketing operations. Problems associated with the design of marketing strategy are emphasized.

Prerequisite, BA 722 or equivalent. *Credit, 3. Staff.*

**730. SEMINAR IN MARKETING
PROBLEMS AND ISSUES.**

Selected areas of pronounced and current interest in the field of marketing. Topics include marketing and public policy, buyer behavior research, and marketing communications.

Prerequisite, BA 722 or equivalent.

Credit, 3. Staff.

735. RISK MANAGEMENT.

Analysis of risks to which a business is exposed, determination of methods of providing protection, including loss prevention techniques, risk retention, self insurance, and use of commercial insurance. Case and field studies included.

Credit, 3. Mr. Osborn.

740. MANAGERIAL ECONOMICS.

Application of micro-economic analysis to typical business decisions such as: cost and profit analysis; demand and pricing; investment analysis and capital budgeting; and the uses of economic forecasting in business decisions.

Prerequisite, one semester intermediate Micro-Economic Theory. *Credit, 3. Staff.*

742. OPERATIONS MANAGEMENT.

Analysis of production problems and solution techniques applicable in industrial analysis.

Credit, 3. Staff.

746. BUSINESS LOGISTICS.

Management of the physical supply and distribution process.

Credit, 3. Mr. Rivers.

751. ORGANIZATION THEORY.

Examination and evaluation of the various theories of organization and the research underlying each theory to establish foundation for explanation and critical analysis of administrative processes.

Credit, 3. Staff.

752. BUSINESS POLICY.

Capstone course requiring application of knowledge, theories, and techniques derived from previous courses, using integrative cases and empirical observations to formulate improved policies and plans.

Credit, 3. Staff.

**754. MANAGEMENT SCIENCE
TECHNIQUES IN ENVIRON-
MENTAL PLANNING.**

Introduction to mathematical and computer models and techniques which are useful in the description and control of environmental systems. Large scale computer models used to demonstrate the use of the techniques in the analysis of selected representative problems.

Credit, 3. Mr. Kaczka.

755. GAME THEORY.

Zero and non-zero games including theory, solution techniques, and study of experimental literature based upon game theory.

Prerequisite, B.A. 758 and B.A. 759.

Credit, 3. Staff.

**756. QUANTITATIVE
METHODS III.**

Statistical methods employed in collection, analysis, and interpretation of data. Business applications of sampling, analysis of variance, experimental design, regression analysis, and forecasting models.

Credit, 3. Staff.

**757. QUANTITATIVE METHODS
IN BUSINESS
ADMINISTRATION.**

Application of probability theory (discrete and continuous) stochastic process, linear, quadratic and dynamic programming, waiting lines, sequencing, and computer simulation models to selected problems in management science.

Credit, 3. Mr. Corcoran, Mr. Belovicz.

**758. DETERMINISTIC MODELS
IN MANAGEMENT
SCIENCE.**

Introduction to deterministic models and techniques relevant to business problems. Topics include Kuhn-Tucker theory, mathematical programming, difference equations and discrete and continuous maximum principles.

Credit, 3. Staff.

**759. PROBABILISTIC MODELS OF
MANAGEMENT SCIENCE.**

Introduction to probabilistic models and statistical techniques relevant to the understanding of business problems.

Credit, 3. Staff.

760. WORK STANDARDS AND
JOB CLASSIFICATION.

A survey of the principles and basic requirements involved in evaluating and classifying job positions, in establishing and applying production standards, and in work simplification.

Prerequisite, Personnel Management.

Credit, 3.

761. SEMINAR IN PERSONNEL
MANAGEMENT.

Current practices and major problems of personnel administration through use of the case method and role playing techniques.

Prerequisite, Personnel Management.

Credit, 3. Mr. Young.

762. MANAGEMENT OF
INDUSTRIAL RELATIONS.

Organization and administration of the industrial relations function within business firms, with emphasis on alternative approaches to management rights and responsibilities in labor relations.

Prerequisite, Management-Union Relations I.

Credit, 3. Mr. Conlon.

763. SEMINAR IN INDUSTRIAL
RELATIONS.

Analysis of the major current problems encountered by business management in the negotiation and administration of labor relations agreements. A major research study is required of all students.

Prerequisite, Management-Union Relations I.

Credit, 3. Mr. Conlon.

770. MANAGEMENT SCIENCE
AND MANAGERIAL PLAN-
NING AND CONTROL
SYSTEMS.

Application of the methodology of management science to problems of design testing and evaluation of facilities usage, manpower organization and information procedures actually employed by business firms or government agencies to execute socio/economic purposes of society.

Credit, 3. Mr. Hare, Mr. McGarrah.

799. SEMINAR IN BUSINESS
ADMINISTRATION.

The relationship of business and management to the environment in which they operate.

Credit, 3. Mr. Silver.

800. MASTER'S THESIS. *Credit, 9.*

MASTER OF SCIENCE IN
ACCOUNTING.

1. Candidates for the degree of Master of Science in Accounting must satisfactorily complete 30 semester hours of approved graduate work provided such students have completed their undergraduate degree with a major in Accounting from an accredited college or university.

2. For those students who do not hold an undergraduate degree in Accounting, the School shall determine what courses will constitute adequate preparation for graduate level courses.

3. Permission to present a thesis may be granted to qualified candidates. The thesis proposal must be approved by the end of the first semester. Six to nine credit hours in lieu of course credit is allowed for a thesis.

4. All candidates will be required to pass a comprehensive examination.

5. Applicants for admission are required to take the Admission Test for Graduate Study in Business given each year by the Educational Testing Service of Princeton, N.J., to which applicants should write for further information.

6. Twenty-one credit hours of the 30 advanced credits required for the M.S. in Accounting degree must be in courses designed exclusively for graduate students.

7. All expense and fees must be paid before the degree will be conferred.

M.S. IN ACCOUNTING COURSES.
REQUIRED COURSES FOR M.S. IN
ACCOUNTING.

Accounting 703, Accounting 704, Accounting 705, and BA 756. One elective from Accounting 701, Accounting 702, or BA 712. One graduate level economics course. One elective from BA 706, BA 751, or BA 799. One course in Computer Science. A minimum of 21 credit hours is required in 700 series courses.

701. C.P.A. PREPARATION.

Areas covered in the uniform C.P.A. examinations with emphasis on techniques of problem solving. Designed for those preparing to take the C.P.A. examination.

Credit, 3. Mr. Lentilhon.

702. ACCOUNTING SYSTEMS.
Accounting systems and their relationship to other business information systems.

Credit, 3. Mr. Burch, Mr. Krzystofik.

703. ACCOUNTING THEORY.

Agreed and controversial criteria for collecting and reporting financial information. Examination of the professional literature.

Credit, 3. Mr. Backer, Mr. Simpson.

704. CONTEMPORARY ACCOUNTING ISSUES.

Investigation and analysis of selected contemporary issues in accounting with presentation of individual findings through discussion and reports.

Credit, 3. Mr. Backer.

705. SEMINAR IN ACCOUNTING.

Study and evaluation of current literature in accounting and related fields.

Credit, 3. Mr. Dennler.

MASTER OF SCIENCE IN MANAGEMENT SCIENCE.

This program is designed to develop both the technical skills and management empathy necessary to successfully apply scientific and mathematical techniques to the solution of management problems.

The course requirements for the program include BA 406, 411, 422, 449, 451, 517, 758, 759, 770, and 799, and Philosophy 530. The demonstration of preparation equivalent to any of the courses above will allow their waiver. In addition to the required courses the student must also select at least six electives from a list of courses relevant to his career objectives.

Applicants to the program are required to take either the Admission Test for Graduate Study in Business or the Graduate Record Exam.

M.S. IN MANAGEMENT SCIENCE COURSES

755. GAME THEORY.

Zero and non-zero games including theory, solution techniques, and study of experi-

mental literature based upon game theory. Prerequisites, BA 758 and 759.

Credit, 3. Mr. Belovicz.

758. DETERMINISTIC MODELS IN MANAGEMENT SCIENCE.

Introduction to deterministic models and techniques relevant to business problems. Topics include Kuhn-Tucker theory, mathematical programming, difference equations and discrete and continuous maximum principles.

Credit, 3. Mr. Beals, Mr. Belovicz, Mr. Corcoran, Mr. Kaczka.

759. PROBABILISTIC MODELS OF MANAGEMENT SCIENCE.

Introduction to probabilistic models and statistical techniques relevant to the understanding of business problems.

Credit, 3. Mr. Beals, Mr. Belovicz, Mr. Corcoran, Mr. Kaczka.

770. MANAGEMENT SCIENCE AND MANAGERIAL PLANNING AND CONTROL SYSTEMS.

Application of the methodology of management science to problems of design testing and evaluation of facilities usage, manpower organization and information procedures actually employed by business firms or government agencies to execute socioeconomic purposes of society.

Credit, 3. Mr. Hare, Mr. McGarrah.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS (For either major or minor credit)

Accounting

556. BUSINESS APPLICATIONS OF THE COMPUTER.

Intermediate and advanced computer programming applied to business problems. The COBOL language is presented in depth and is specifically addressed to problems of an accounting nature. The course also surveys the application of the computer in such areas as simulation, PERT, and business gaming.

Prerequisites, Accounting 100 or Comp Sci 121 or equivalent. *Credit, 3.* Staff.

564. ADVANCED COST
ACCOUNTING.

Advanced work in cost accounting theory and procedures through the use of cases, problems, and readings. *Credit, 3.* Staff.

565. ADVANCED ACCOUNTING.

The accounting problems of expanding and declining business enterprises. Emphasis on financial reporting problems of companies that expand by means of acquisition and merger, including foreign subsidiaries. Some coverage of accounting for special sales, procedures and fiduciaries.

Prerequisite, Accounting 262.

Credit, 3. Mr. Fitzgerald, Mr. Simpson.

574. C.P.A. PROBLEMS.

Extensive practice in solutions of problems from the accounting practice parts of recent C.P.A. examinations. Included are problem areas from cost, intermediate, advanced and governmental accounting.

Credit, 3.

Mr. O'Connell, Mr. Lentilhon.

577. AUDITING.

The verification of accounting records dealing with audit theory and procedure.

Credit, 3. Mr. Taylor,
Mr. Krzystofik, Mr. Stone.

578. ADVANCED FEDERAL TAX
PROCEDURES.

Advanced phases of Federal taxation with particular attention to inventories, depreciation, and accounting methods. Study and preparation of returns for partnerships, corporations, estates and trusts; Federal estate and Federal gift taxes.

Prerequisite, Accounting 273.

Credit, 3. Mr. Anderson, Mr. Fitzgerald.

660. INVENTORY CONTROL.

Mathematical modeling applied to control of inventory investments. Emphasis is placed on the recognition of relevant costs for the development and solution of appropriate models

Prerequisites, BA 759 or permission of instructor.

Credit, 3. Mr. Corcoran.

General Business and Finance

502. PROBLEMS IN BUSINESS
FINANCE, I.

Short- and intermediate-term financing: decision-making under uncertainty regarding needs and sources of funds.

Credit, 3. Mr. Barges, Mr. Flanders.

503. PROBLEMS IN BUSINESS
FINANCE II.

Long-term financing; capital budgeting; leasing; reserves and dividend policy; pensions; company expansion; mergers and acquisitions and reorganizations.

(Not open to M.B.A. candidates)

Credit, 3. Staff.

504. MODELS OF FINANCIAL
ANALYSIS AND MANAGEMENT.

An analytical approach to the study of financial management, with emphasis on theoretical topics of financial decision making. Through the use of mathematical, statistical and computer simulation methods various financial decision-making models are made explicit in their assumptions, rigorous in their construction, and testable in their implications.

Prerequisite: Gen Bus 201 and elementary knowledge of mathematics, statistics and programming.

Credit, 3. Mr. Cheng, Mr. Kumar.

520. INVESTMENTS.

Development of a general theory of investment management and its application to individual and institutional investors; computer portfolio management.

Credit, 3. Mr. Cheng, Mr. Deets.

521. SECURITY ANALYSIS.

Examination of factors affecting investment values of securities and methods used in their analysis.

Credit, 3. Mr. Cheng, Mr. Deets.

Prerequisites: Fin 220 and Fin 221 or permission of instructor.

Credit, 3. Mr. Cheng, Mr. Deets.

522. THEORY OF INVESTMENT
PROCESSES.

An in-depth study of portfolio analysis and

stochastic processes in security markets. Emphasis on quantitative solution techniques and testing procedures.

534. ECONOMIC SECURITY.

Public and private programs to prevent or alleviate economic insecurity, including poverty, sub-standard incomes, and economic contingencies. Also listed as Econ 641.

Credit, 3. Mr. Osborn.

**541. MANAGEMENT OF TRAFFIC
AND PHYSICAL DISTRIBUTION.**

A case and problem approach in methods and systems of distribution. Three field trips. (Also listed as Marketing 536.)

Credit, 3. Mr. Rivers.

524. PUBLIC UTILITIES.

Nature, organization and administration of regulated industries; aspects of public regulation at Federal, State, and Local levels as they affect service operations.

Credit, 3. Mr. Rivers.

**545. METROPOLITAN
TRANSPORTATION**

The analysis of economic, social, and technological developments on demand and supply factors for the movement of people and goods within urban areas. Determination of the optimal mix of modal facilities to maximize the total transport resources of the urban area. Attention to the coordination of internal and external transport systems.

Prerequisite: Gen Bus 240 or permission of instructor.

Credit, 3. Mr. Rivers.

550. ADMINISTRATIVE STATISTICS.

Probability and statistical distributions applied to business management problems; application of Bay's theorem to sampling for business decision making under uncertainty.

Credit, 3. Mr. Belovicz.

561 (II). BUSINESS LAW II.

Sales, negotiable instruments and secured transactions; their economic functions and consequences.

Prerequisite, Gen Bus 260.

Credit, 3. Mr. Allan,
Mr. Hartzler, Mr. Silver.

562 (I). BUSINESS LAW III.

Economic functions and consequences of agency, partnerships and corporations.

Prerequisite, Gen Bus 260.

Credit, 3. Mr. Hartzler, Mr. Silver.

563. BUSINESS LAW IV.

Legal problems most commonly encountered by certified public accountants with special attention paid to the subjects currently being included in C.P.A. examinations.

Prerequisite, Gen Bus 260.

Limited to Accounting majors only.

Credit, 3. Mr. Goldman.

**564. LAW OF URBAN
DEVELOPMENT.**

Legal problems generated by the changing urban environment. Topics include the law of race relations, poverty and welfare, land use and land use planning, urban and regional planning.

Prerequisite: Gen Bus 260 or its equivalent.

Credit, 3. Mr. Bonsignore.

**573. INTRODUCTION TO
SIMULATION METHODS.**

The principles and methods of computer simulation. Each student will be expected to construct, test, and run a complex simulation model. (Also listed as IE 573.)

Credit, 3. Mr. Kaczka, Mr. Rubel.

**655. STOCHASTIC MODELS IN
BUSINESS.**

Introduction to the theory of stochastic processes in the formulation of descriptive and normative models and their application to the field of business administration.

Credit, 3. Staff.

658. QUEUEING THEORY MODELS.

Development and application of models of waiting lines, including single and multiple channel and single and multiple stage queues for various priorities and queue disciplines.

Prerequisites, BA 758 and BA 759 and permission of instructor.

Credit, 3. Staff.

659. TIME SERIES ANALYSIS.

Analysis of time series and dynamic models for use in forecasting and control of business and economic systems.

Credit, 3. Staff.

669. THEORY OF INVESTMENT PROCESSES.

An in-depth study of portfolio analysis and stochastic processes in security markets. Emphasis on quantitative solution techniques and testing procedures.
Prerequisites, BA 220 and BA 221 or permission of instructor.

Credit, 3. Mr. Cheng, Mr. Deets.

Management

517. BEHAVIORAL SCIENCE MODELS IN BUSINESS.

Examination of behavioral science theories and models as they apply to the behavioral problems of enterprise. *Credit, 3.* Mr. Frey.

534. WAGE AND SALARY ADMINISTRATION.

Objectives, procedures and problems involved in establishment and administration of operative and executive compensation plans.
Credit, 3. Mr. Wortman.

556. MANAGERIAL APPLICATIONS OF COMPUTER PROGRAMMING

Intermediate and advanced computer programming with emphasis on problems in Accounting and Management Information Systems.
Prerequisite: Management 100, or permission of instructor.
Credit, 3. Staff.

641. MANAGEMENT DECISION SIMULATION.

Participation in management of a firm in a simulated industry. Students, organized into management teams, apply their knowledge of business administration and economics in a competitive struggle for profit and market position.
Credit, 3. Mr. Chen.

644. MANAGEMENT-UNION RELATIONS I.

Comparison of union-management objectives, functions and structures including scope and impact of union penetration into areas of managerial authority.

Credit, 3. Mr. Conlon, Mr. Wortman, Mr. Carlisle, Mr. Bornstein.

645. MANAGEMENT-UNION RELATIONS II.

Problems in the interpretation and adminis-

tration of collective bargaining agreements are studied by use of the case method of analysis.

Prerequisite, Management 644 or permission of instructor.

Credit, 3. Mr. Conlon, Mr. Wortman, Mr. Carlisle, Mr. Bornstein.

Marketing

513. ADVANCED MARKETING RESEARCH.

Selected areas of marketing research. Emphasis on nonsurvey research techniques in marketing. Substantive problems of experimental research and research design and analysis. Class problems will consist of laboratory or field experiments.
Prerequisite, Marketing 212, or permission of instructor.

Credit, 3. Mr. Monroe, Mr. Venkatesan.

519. MARKETING STRATEGY.

Students are exposed to realistic problems by means of a computerized decision simulation covering the various aspects of marketing. Students are given practice in seeking solutions to marketing problems through an integration of factors pertinent to the development of marketing strategies.
Prerequisite, permission of instructor.
Credit, 3. Mr. Wolf.

521. PRODUCT PLANNING AND DEVELOPMENT.

Examination and analysis of the factors pertinent to effective product decisions by marketing managers. The organization of the product planning function, matching products and markets, and methods for reducing new product risk.

Prerequisite, Marketing 201 or permission of instructor.
Credit, 3. Mr. Worthing.

522. MARKETING COMMUNICATIONS.

Development of effective marketing communication strategies based upon an understanding of the characteristics of audiences. Conceptual material from communications theory.

Prerequisite, Marketing 231 or permission of instructor.
Credit, 3. Staff.

523. MARKETING NETWORK ANALYSIS.

A systems approach to the management of all activities that facilitate the movement of goods and coordination of supply and demand. Problems of designing and managing a product distribution network.

Prerequisite, Marketing 201 or permission of instructor. *Credit, 3.* Mr. Monroe.

524. ANALYSIS FOR PRICING DECISIONS.

The relationship of pricing objectives, methods, and policies to market behavior and the goals of the firm. Pricing models and contributions of behavioral sciences to pricing analysis.

Prerequisites, Marketing 201 and Econ 126, or permission of instructor.

Credit, 3. Mr. Monroe.

PH.D. PROGRAM

The graduate program leading to the degree of Doctor of Philosophy in Business Administration is designed primarily for students interested in a college teaching career. A minimum of three years is normal for the degree. At least two years of formal course study involving no less than 48 credit hours are required.

The first-year core course program emphasizes both the quantitative and behavioral management sciences applicable to business administration and is required of all students. The first year core includes: BA 801 I & II, 805 I & II, Economics 701 or 702, and Economics 705 or 706.

The second-year course program is developed according to a student's major area of interest and concentration. Four general and five functional fields of concentration are offered. The general fields are: Business and its Environment, Information and Control Systems, Organizational and Administrative Behavior, and Quantitative Management Science. The functional fields are: Accounting, Finance, Industrial and Personnel Relations, Marketing, and Production.

Applicants who apply for admission to the doctoral program are required to sub-

mit a score on the Admission Test for Graduate Study in Business. Information and application forms for this test may be obtained from the Educational Testing Service, 20 Nassau Street, Princeton, New Jersey 08540.

Prerequisite requirements include prior study in the fields of business administration, economics, mathematics, statistics, sociology, and psychology. A guidance committee will determine prerequisite and doctoral course requirements for each student. Students admitted to the program will be expected to complete all course requirements for the degree, including deficiencies, by enrolling in not more than seventy-two credit hours of study.

COURSES FOR THE Ph.D. IN BUSINESS ADMINISTRATION

801. PHILOSOPHICAL FOUNDATIONS OF BUSINESS ADMINISTRATION.

Conceptual foundations of business administration investigated in context of social and economic philosophy. Topics include corporate objectives and goal models, theories of organization, and social responsibilities of corporate management.

Credit, 3. Mr. O'Donnell.

802. BUSINESS ORGANIZATION AND ADMINISTRATIVE THEORY.

Investigation and critique of contemporary theories of organization, administration, and decision, with a view of their scientific support and practicality for increasing rationality, prediction, and control in business administration.

Credit, 3. Mr. Finch, Mr. Litterer.

803. MANAGEMENT SYSTEMS: THEORY, ANALYSIS AND DESIGN.

Review of systems with particular stress on normative behavioral systems. Designing, implementing, operating, maintaining, and controlling such systems. The organization is viewed as a total system. The student is expected to design a behavioral system as a class project.

Credit, 3. Mr. Young.

804. DECISION MODELS IN
BUSINESS ADMINISTRATION.
Application of probability theory and selected topics in mathematics to stochastic and deterministic managerial decision models.

Credit, 3. Mr. Kaczka, Mr. Belovicz.

805 I, II. STATISTICAL ANALYSIS
FOR BUSINESS
RESEARCH.

Analysis of statistical theory and techniques relevant to business research and decision making. The first semester covers probability and distribution theory; the second semester covers decision theory and multivariate methods.

Credit, 3-6. Mr. Frederick.

806. SEMINAR IN QUANTITATIVE
MANAGEMENT SCIENCE.

A presentation of journal reports on business topics utilizing a quantitative approach.

Credit, 3-6. Mr. Belovicz.

807 I, II. SEMINAR IN BEHAVIORAL
SCIENCE.

Selection of relevant findings in the behavioral and social sciences regarding human organizational behavior and convert them into forms suitable for transmission and application in business administration.

Credit, 3-6. Mr. Finch.

808. ADVANCED TOPICS IN
BUSINESS ADMINISTRATION.

An advanced topics section is available in each General or Functional Field of Study, to facilitate investigation of current literature and research effort in these areas.

Credit, 3-6. Staff.

809. INTERNATIONAL ASPECTS OF
BUSINESS ADMINISTRATION.

The basis of international division of labor, the history of international business policy, and the cultural differences that affect the management of international business enterprises.

Credit, 3. Mr. Liander.

810. TUTORIAL STUDY IN
BUSINESS ADMINISTRATION.

Individualized secondary or applied research in special areas of guided doctoral-

level investigation, permissible with consent of mentor when a suitable course in such areas is not available and the studies are related to the career-goal of the scholar.

Credit, 3-6. Staff.

811. BUSINESS HISTORY.

American business institutions as they have evolved through time. Attention to the impact of social and economic processes on their development and operations.

Credit, 3. Staff.

812. JURISPRUDENCE AND
BUSINESS.

Social-scientific and philosophical theories of law; the systems, functions, processes and limits of law; applications to the business organization in its external and internal affairs.

Credit, 3. Staff.

821-822. ADVANCED TOPICS IN
MANAGEMENT SCIENCE
I AND II.

Selected topics of current significance in mathematical, statistical, computer, and behavioral approaches to management and administration. Either semester may be elected independently.

Credit, 3-6. Mr. Balintfy.

823. MATHEMATICAL
PROGRAMMING.

Application of linear, quadratic, integer, and dynamic programming models and algorithms in pricing and resource allocation by firms; sensitivity analysis and parametric programming.

Credit, 3. Mr. Balintfy.

831. LONG RANGE BUSINESS
PLANNING.

Advanced and intensive study of long range planning practices in business firms with emphasis on the planning process in relation to other managerial processes and on the most recent methods of reducing risk and uncertainty in long term planning strategies.

Credit, 3. Mr. Michael.

832. DYNAMICS OF CORPORATE
ORGANIZATION.

Examination of changes in corporate organization as adaptive responses to challenges and constraints imposed upon the corpora-

tion by variations in endogenous and exogenous factors. *Credit, 3.* Mr. Michael.

841. MANAGEMENT INFORMATION THEORY.

Theories and applications of management information system in the context of total servomechanism system concept. Topics include the generation, organization, transformation, dissemination, codification, discrimination, and economics of information.

Credit, 3. Mr. Hare.

842. MANAGEMENT CONTROL SYSTEMS.

That function of total systems theory which provides direction in attaining planned objectives of the system. Various theories of control and measurement are considered in relation to organization resources and information requirements. *Credit, 3.* Mr. Hare.

851. THEORY AND SCIENCE IN MARKETING.

Examination of the state of marketing knowledge, focusing on the content and validity of marketing thought, theories, and other substantive and methodological contributions to the development of marketing science. *Credit, 3.* Staff.

852. SOCIAL SCIENCE ISSUES IN MARKETING.

Explicit illustrations of material from the various social science disciplines that have been used to expand understanding of marketing; discernment of areas of ignorance about marketing involving social science variables, and methodological deficiencies in the study of social science related marketing phenomena. *Credit, 3.* Staff.

861. ADVANCED ACCOUNTING THEORY.

A critical examination of the origin, development and current status of accounting theory and its relationship to other disciplines and the needs of report users. Independent research required.

Credit, 3. Mr. Backer.

862. MANAGEMENT INFORMATION PROBLEMS.

Methods of research for establishing: (1) The behavioral impact of incremental differences in information; (2) The determi-

nants of useful information for problem solving and their normative implications. Existing literature is examined.

Credit, 3. Mr. Backer.

871. MICRO THEORY OF FINANCE.

Optimum financial policies and decisions of non-financial firms. Theory of competition and optimum asset management of financial firms.

Prerequisite, 12 hours in finance and economics. *Credit, 3.* Mr. Barges.

872. FINANCIAL INTERMEDIARIES AND MARKETS.

Financial intermediates and financial markets and the development of a theory of financial intermediation as it relates to growth, employment, and price levels.

Credit, 3. Mr. Ludtke.

881. PRODUCTION MANAGEMENT ANALYSIS.

Application of mathematical and statistical methods and models for production management decisions and problem analyses, and for managerial planning and control.

Credit, 3. Mr. McGarrah.

882. PRODUCTION MANAGEMENT POLICY.

Formulation and administration of production and operations management policies with reference to developing an effective total business strategy.

Credit, 3. Mr. McGarrah.

891. MANPOWER PLANNING.

Investigation and comparative evaluation of systems of manpower planning both at the corporate and national levels, including systematic manpower inventory appraisal.

Credit, 3. Mr. Wortman.

892. LEGAL ASPECTS OF INDUSTRIAL AND LABOR RELATIONS.

The historical evolution of national labor policy from its English origin in 1349 through modern experiences. Common law, statutory and constitutional developments of labor policy are examined against an historical, political and economic background.

Credit, 3. Mr. Bornstein.

900. DOCTORAL DISSERTATION.

Chemical Engineering

GRADUATE FACULTY

John W. Eldridge, *Head of the Department of Chemical Engineering and Professor of Chemical Engineering*, B.S., Maine, 1942; M.S., Syracuse University, 1946; Ph.D., University of Minnesota, 1949.

Kenneth D. Cashin, *Professor of Chemical Engineering*, B.S., Worcester Polytechnic Institute, 1947; M.S., 1948; Ph.D., Rensselaer Polytechnic Institute, 1955.

David C. Chappellear, *Adjunct Associate Professor of Chemical Engineering*, B.E., Yale, 1953; Ph.D., Princeton, 1960.

James M. Douglas, *Professor of Chemical Engineering*, B.E., Johns Hopkins, 1954; Ph.D., University of Delaware, 1960.

Hans C. Duus, *Professor Emeritus of Chemical Engineering*, B.S., Carleton College, 1918; Ph.D., Harvard, 1925.

Robert S. Kirk, *Associate Professor of Chemical Engineering*, B.S., Illinois Institute of Technology, 1943; M.S., Illinois Institute of Technology, 1943; Ph.D., University of Wisconsin, 1948.

James R. Kittrell, *Associate Professor of Chemical Engineering*, B.S., Oklahoma State University, 1962; M.S., University of Wisconsin, 1963; Ph.D., 1966.

Robert L. Laurence, *Associate Professor of Chemical Engineering*, B.S., Massachusetts Institute of Technology, 1957; M.S., University of Rhode Island, 1960; Ph.D., Northwestern, 1965.

Robert W. Lenz, *Professor of Chemical Engineering*, B.S., Lehigh University, 1949; M.S., Institute of Textile Technology, 1951; Ph.D., State University of New York, 1956.

E. Ernest Lindsey, *Professor of Chemical Engineering*, B.S., Georgia Institute of Technology, 1936; Ph.D., Yale, 1940.

Thomas J. McAvoy, *Associate Professor of Chemical Engineering*, B.S., Brooklyn Polytechnic Institute, 1961; Ph.D., Princeton, 1964.

Stanley Middleman, *Professor of Chemi-*

cal Engineering, B.S., Johns Hopkins, 1958; D. Eng., 1961.

Leland H. S. Roblee, Jr., *Professor of Chemical Engineering*, B.S., Purdue, 1949; M.S., 1956; Ph.D., 1958.

W. Leigh Short, *Associate Professor of Chemical Engineering*, B.Sc., University of Alberta, 1956; M.Sc., 1957; Ph.D., University of Michigan, 1962.

Marcel Vanpee, *Professor of Chemical Engineering*, B.S., M.S., University of Louvain, Belgium; Ph.D., 1940.

The graduate program in chemical engineering is designed to emphasize advanced study in engineering fundamentals rather than specific technological applications. To be admitted to full graduate status in this field either of the following requirements should be met:

1. Applicant must have a Bachelor's degree in chemical engineering from a recognized school, or

2. Applicant must show satisfactory academic training or demonstrate proficiency in these subjects as a minimum:

Mathematics: through Calculus.

Chemistry: through Organic and Physical.

Engineering Mechanics: Statistics, Strength of Materials, Dynamics.

Chemical Engineering: Stoichiometry, Unit Operations, Thermodynamics (including thermodynamics of chemical change).

Electrical Engineering: Elements of Circuits and Machines.

REQUIREMENTS FOR M.S. DEGREE.

1. ChE 800. Thesis, maximum 10 credits.
2. At least four ChE 700 series courses.
3. Additional graduate credit courses, chosen according to the student's interests from the fields of engineering, science, mathematics and the humanities, to constitute the total requirement of 30 credits for M.S. degree.
4. University-wide requirements as described on p. 38. In the Chemical Engineering Department the Ph.D. candidate

is required to attain successful completion (with a grade of B or better) of English 634, Advanced Technical Writing. Other than the requirement described above, the department does not impose any requirements beyond those established by the University Graduate School.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS.

Credit, 1-3.

701. CHEMICAL ENGINEERING THERMODYNAMICS I.

Review of the fundamental laws of thermodynamics, P-V-T relations of fluids, thermodynamic functions, fluid flow, compression and expansion of gases, liquefaction and separation of gases.

Prerequisite, ChE 126 or equivalent.

Credit, 3. Mr. Short.

702. CHEMICAL ENGINEERING THERMODYNAMICS II.

Phase equilibria and chemical reaction equilibria and their applications in chemical processing.

Prerequisites, Chem 586 and ChE 701.

Credit, 3. Mr. Short.

703. CHEMICAL ENGINEERING ANALYSIS III.

Mathematical analysis of chemical engineering problems continued. Topics include advanced matrix techniques, perturbation analysis, and analytical solutions to partial differential equations.

Prerequisite, ChE 662.

Credit, 3. Mr. Douglas.

705. CHEMICAL REACTOR DESIGN.

Principles of chemical reaction kinetics and their application to industrial chemical processes. Systems homogeneous and heterogeneous, batch and flow, catalyzed and uncatalyzed, isothermal and adiabatic are discussed.

Prerequisites, Chem 586, Math 186 or 541 or equivalent.

Credit, 3. Mr. Kirk.

706. ADVANCED KINETICS AND REACTOR DESIGN.

Topics from the recent literature including reactions in gradients, catalysis and optimization of chemical reactors by methods of dynamic programming.

Prerequisites, ChE 705 and ChE 361 or equivalent.

Credit, 3. Mr. Kirk.

707. ADVANCED PROCESS CONTROL.

Theory of closed loop control. Use of Laplace transforms and transfer functions; stability analysis, root-locus, Bode diagrams; frequency response and time response in controller design.

Prerequisite, ChE 376 or equivalent.

Credit, 3. Mr. McAvoy.

708. PROCESS DYNAMICS.

Translating process performance into mathematical form, application to control system design. Topics include fluid systems, thermal systems, mass transfer systems (distillation, drying); reaction kinetics.

Prerequisite, ChE 707.

Credit, 3. Mr. Douglas.

710. APPLIED OPTIMIZATION IN CHEMICAL ENGINEERING II.

Continuation of Optimization Techniques I. Topics include non-linear programming, (Kuhn-Tucker theorem, quadratic programming), geometric programming, calculus of variations, dynamic programming, Pontryagin's Maximum Principle.

Prerequisite, ChE 688.

Credit, 3. Mr. Novak.

711. TRANSPORT PHENOMENA I.

Introduction to advanced work in chemical engineering as applied to the transport of momentum, energy, and material. Background for fluid flow, heat transfer and mass transfer. Topics covered include: viscosity, thermal conductivity and diffusivity, momentum and energy balances, friction, turbulence, fluid friction, the motion of suspended solids in fluids, and non-Newtonian fluids.

Prerequisite, ChE 256.

Credit, 3. Mr. Roblee.

712. TRANSPORT PHENOMENA II.

Continuation of ChE 711. Topics covered include: thermal conductivity and mass diffusivity, energy balances, analytical solutions for steady and unsteady state energy and mass transfer, radiation and convection, interphase transfer and over-all balances. Emphasis on problem solutions.

Prerequisite, ChE 711.

Credit, 3. Mr. Roblee.

713. ANALOG-HYBRID SIMULATION IN CHEMICAL ENGINEERING.

Topics in Analog-Hybrid simulation useful to students beginning research. Linear and non-linear components, magnitude and time scaling, digital logic, hybrid operation.

Credit, 3. Mr. Novak.

714. POLYMER RHEOLOGY.

Definition and measurement of rheological properties; continuum mechanics and constitutive equations; molecular theories of polymer deformation; correlation and interrelation of material functions. Relation of the various approaches taken in describing the viscous and viscoelastic properties of polymers, evaluation of the utility of these approaches, and indication of the role of modern rheology in the characterization and processing of polymers.

Prerequisite, ChE 712.

Credit, 3. Mr. Middleman.

715. COMBUSTION PHENOMENA.

Fundamentals of combustion. Topics include: combustion thermodynamics, Rankin-Hugoniot relations, propagation of explosions, laminar flames, turbulent flames, detonations, radiation processes, kinetics of combustion.

Prerequisites, ChE 358 and 380.

Credit, 3. Mr. Vanpee.

731. MASS TRANSFER.

Mass transfer with emphasis on theory of diffusion. Topics include molecular diffusion, multicomponent diffusion, convective mass transfer, diffusion with chemical reaction and chromatographic separations.

Prerequisites, ChE 662, 712.

Credit, 3. Mr. Laurence.

741. ADVANCED PROCESS DESIGN I.

Solution of advanced process design problems which require the use of principles studied in previous courses. The problems may be conceptual designs, economic decision making in process design or engineering design calculations for a specific process.

Prerequisites, ChE 256, 382.

Credit, 3. Mr. Short.

800. MASTER'S THESIS.

A theoretical or experimental study of some chemical engineering problem. Credit determined by the work done, and by agreement with the Department and the Graduate Thesis Committee.

Credit, 6-10.

801. ADVANCED TOPICS IN CHEMICAL ENGINEERING.

An in-depth exploration of the advanced aspects of an area pertinent to chemical engineering.

Prerequisites, ChE 662, 712.

Credit, 1-3. Department Staff.

802. ADVANCED TOPICS IN TRANSPORT PHENOMENA.

An in-depth exploration of a particular aspect of advanced transport phenomena.

Prerequisites, ChE 662, 712.

Credit, 1-3. Mr. Roblee.

803. ADVANCED TOPICS IN THERMODYNAMICS.

An intensive consideration of current literature and research in a particular area of thermodynamics.

Prerequisites, ChE 702.

Credit, 1-3. Mr. Short.

804. ADVANCED TOPICS IN KINETICS.

An exploration of selected topics from the current literature.

Prerequisite, ChE 705.

Credit, 1-3. Mr. Kirk.

805. ADVANCED TOPICS IN PROCESS DYNAMICS AND CONTROL.

Selected topics of interest from the current literature, discussed in depth.

Prerequisites, permission of instructor.

Credit, 1-3. Mr. Douglas.

**806. ADVANCED TOPICS IN
CHEMICAL ENGINEERING
ANALYSIS.**

For advanced graduate students in chemical engineering. Explores an aspect of the application of mathematics to problems in chemical engineering. Specific topics vary according to instructor and student interests. Prerequisites, ChE 662, 703 or permission of instructor. *Credit, 1-3.* Mr. McAvoy.

**807. ADVANCED PROCESS
DESIGN II.**

Continuation of Advanced Process Design I with emphasis on more complex designs and the uses of mathematical models or optimization techniques in the solution of these design problems.

Prerequisites, ChE 256, 257, 688.

Credit, 3. Mr. Short.

900. DOCTORAL DISSERTATION.

A theoretical or experimental study of a chemical engineering problem. Credit determined by the work done, and by agreement with the Department and the Graduate Thesis Committee. *Credit, 26-30.*

**COURSES OPEN TO BOTH
GRADUATE AND UNDER-
GRADUATE STUDENTS**

(For either major or minor credit)

**660. AIR POLLUTION CONTROL
PROCESSES.**

Introduction to the techniques of air pollution control; particulate removal, wet and dry scrubbing processes, removal of selected species from gases (e.g. sulfur dioxide).

Prerequisites, Freshman chemistry and permission of instructor.

Credit, 2. Mr. Short.

**661. CHEMICAL ENGINEERING
ANALYSIS.**

Application of mathematical techniques to chemical engineering problems. Emphasis on analysis of problems and the devising of satisfactory mathematical models. Study of machine computation with digital and analog devices.

Prerequisites, ChE 256 and Math 256.

Credit, 3. Mr. Roblee.

**662. CHEMICAL ENGINEERING
ANALYSIS II.**

Mathematical analysis of chemical engineering problems continued. Topics include: matrix methods, vector analysis, calculus of finite differences, numerical solution of ordinary and partial differential equations, complex variables and Laplace transformations. Emphasis on applying these techniques to real chemical engineering processes and on the physical and mathematical interpretation of the results.

Prerequisite, ChE 361 (661).

Credit, 3. Mr. Novak.

**663, 664. SURVEY OF NUCLEAR
ENGINEERING I, II.**

Introduction to the principles of nuclear physics and a survey of problems involved in the design and operation of nuclear reactors. Heat transfer, shielding, metallurgy, controls, waste disposal and health physics. Two lectures, one laboratory period per week each semester.

Prerequisite, two semesters of physics and mathematics through integral calculus.

Credit, 3 each semester. Mr. Marcus.

**676. PROCESS CONTROL AND
DYNAMICS.**

Theoretical and practical factors governing automatic control of industrial processes. Topics include control systems, measurement devices, control modes, mathematical relationships, and laboratory work.

Prerequisites, ChE 256 and Math 256.

Credit, 3. Mr. Novak.

670. APPLIED POLYMER SCIENCE.

A survey of the methods of preparing important synthetic polymers, and their properties and applications.

Prerequisite, undergraduate organic and physical chemistry.

Credit, 3. Mr. Lenz.

**684. PROCESS AND PLANT
DESIGN.**

Application of the principles of stoichiometry, unit operations, thermodynamics and cost estimation to the design of chemical plants. The economic factors influencing the design are stressed. Lecture and laboratory. Prerequisites, ChE 256 and ChE 381 or equivalent. *Credit, 3.* Mr. Cashin.

688. OPTIMIZATION.

Fundamental ideas and application of optimization techniques in operation and design. Topics include: extrema of functions, effect of constraints, LaGrange multipliers, introduction to linear programming, geometric programming and dynamic programming.

Prerequisite, Math 187.

Credit, 3. Mr. Novak.

689. OPTIMIZATION USING

VARIATIONAL TECHNIQUES.

Application of the calculus of variations, Pontryagin's maximum principle, and dynamic programming to the design and control of chemical process equipment. Systems described by both ordinary and partial differential equations are considered. Topics include: optimal reactor design, the synthesis of optimal control systems and optimal periodic operation of processing units.

Prerequisite, Math 187.

Credit, 3. Mr. Douglas.

Chemistry

GRADUATE FACULTY

William E. McEwen, *Head of the Department of Chemistry and Professor of Chemistry*, B.A., Columbia, 1944; M.A., 1945; Ph.D., 1947.

Ronald D. Archer, *Professor of Chemistry*, B.S., Illinois State Normal, 1953; M.S., 1954; Ph.D., Illinois, 1959.

Ramon M. Barnes, *Assistant Professor of Chemistry*, B.S., Oregon State, 1962; M.A., Columbia, 1963; Ph.D., Illinois, 1966.

John F. Brandts, *Associate Professor of Chemistry*, B.A., Miami, 1956; Ph.D., Minnesota, 1961.

Paul E. Cade, *Associate Professor of Chemistry*, B.S., Texas, 1954; Ph.D., Wisconsin, 1961.

George W. Cannon, *Professor of Chemistry*, B.A., Dakota Wesleyan University, 1939; M.A., Illinois, 1941; Ph.D., 1943.

Louis A. Carpino, *Professor of Chemistry*, B.S., Iowa State College, 1950; M.S., Illinois, 1951; Ph.D., 1953.

John A. Chandler, *Assistant Professor of Chemistry*, B.S., Ohio, 1955; M.S., Illinois, 1958; Ph.D., 1959.

James C. W. Chien, *Professor of Chemistry*, B.S., St. John's, 1949; B.A., Wayland College, 1950; M.S., Kentucky, 1951; Ph.D., Wisconsin, 1954.

David J. Curran, *Associate Professor of Chemistry*, B.A., Massachusetts, 1953; M.A., Boston College, 1958; Ph.D., Illinois, 1961.

John W. George, *Associate Professor of Chemistry*, A.B., Princeton, 1948; M.A., North Carolina, 1950; Ph.D., M.I.T., 1958.

Robert R. Holmes, *Professor of Chemistry*, B.S., Illinois Institute of Technology, 1950; Ph.D., Purdue, 1954.

Clifford P. Lillya, *Associate Professor of Chemistry*, A.B., Kalamazoo College, 1959; Ph.D., Harvard, 1964.

William J. MacKnight, *Associate Professor of Chemistry*, B.S., Rochester, 1958; M.A., Princeton, 1963; Ph.D., 1964.

Earl J. McWhorter, *Associate Professor of Chemistry*, B.S., Rensselaer Polytechnic Institute, 1950; Ph.D., Cornell, 1955.

Bernard Miller, *Associate Professor of Chemistry*, B.S., C.C.N.Y., 1951; M.A., Columbia, 1953; Ph.D., 1955.

John W. Olver, *Assistant Professor of Chemistry*, B.S., Rensselaer Poly. Institute, 1955; M.S., Tufts, 1956; Ph.D., Massachusetts Institute of Technology, 1961.

John L. Ragle, *Professor of Chemistry*, B.S., California (Berkeley), 1954; Ph.D., State College of Washington, 1957.

Marvin D. Rausch, *Professor of Chemistry*, B.S., Kansas, 1952; Ph.D., 1955.

Marion B. Rhodes, *Assistant Professor of Chemistry*, B.S., Connecticut, 1958; M.S., Massachusetts, 1960; Ph.D., 1966.

George R. Richason, Jr., *Associate Head of Department of Chemistry and Professor of Chemistry*, B.S., Massachusetts, 1937; M.S., 1939.

John E. Roberts, *Professor of Chemistry*, B.S., New Hampshire, 1942; M.S., 1944; Ph.D., Cornell, 1947.

Robert L. Rowell, *Associate Professor of Chemistry*, B.S., State Teachers College at Bridgewater, Mass., 1954; M.S., Boston College, 1956; Ph.D., Indiana, 1960.

Sidney Siggia, *Professor of Chemistry*, B.S., Queens College, 1942; M.S., Brooklyn Polytechnic Institute, 1943; Ph.D., 1944.

J. Harold Smith, *Professor of Chemistry*, B.S., Utah, 1936; M.S., 1938; Ph.D., Wisconsin, 1941.

Richard S. Stein, *Professor of Chemistry*, B.S., Brooklyn Polytechnic Institute, 1945; M.S., Princeton, 1948; Ph.D., 1949.

Thomas R. Stengle, *Associate Professor of Chemistry*, B.S., Franklin & Marshall College, 1951; M.S., Michigan, 1953; Ph.D., 1961.

Howard D. Stidham, *Assistant Professor of Chemistry*, B.S., Trinity College, 1950; Ph.D., Massachusetts Institute of Technology, 1955.

Robert M. Williams, *Assistant Professor of Chemistry*, B.A., Dartmouth, 1951; M.S., New Hampshire, 1953; Ph.D., Iowa State, 1958.

Oliver T. Zajicek, *Assistant Professor of Chemistry*, B.S., Baldwin-Wallace, 1950; M.S., Wayne State, 1958; Ph.D., 1961.

ASSOCIATED FIVE-COLLEGE GRADUATE FACULTY

Mary K. Campbell, *Assistant Professor of Chemistry*, (Mount Holyoke College), B.A., Rosemont College, 1960; Ph.D., Indiana University, 1966.

George S. Durham, *Professor of Chemistry*, (Smith College), B.A., Reed College, 1935; Ph.D., New York University, 1939.

Richard D. Fink, *Assistant Professor of Chemistry*, (Amherst College), A.B., Harvard, 1958; Ph.D., Massachusetts Institute of Technology, 1962.

George M. Fleck, *Associate Professor of Chemistry*, (Smith College), B.S., Yale, 1956; Ph.D., Wisconsin, 1961.

George E. Hall, *Professor of Chemistry*, (Mount Holyoke College), B.S., Yale, 1933; Ph.D., 1942.

Anna J. Harrison, *Professor of Chemistry*, (Mount Holyoke College), A.B., University of Missouri, 1933; B.S., 1935; M.A., 1937; Ph.D., 1948.

Kenneth P. Hellman, *Assistant Professor of Chemistry*, (Smith College), A.B., Drew University, 1956; M.S., Michigan State, 1959; Ph.D., 1962.

J. Stephen Kittelberger, *Assistant Professor of Chemistry*, (Amherst College), A.B., Hamilton College, 1961; A.M., Princeton, 1963; Ph.D., 1966.

Allen Kropf, *Associate Professor of Chemistry*, (Amherst College), B.S., Queens, 1951; Ph.D., University of Utah, 1954.

Thomas H. Lowry, *Assistant Professor of Chemistry*, (Smith College), A.B., Princeton, 1960; Ph.D., Harvard, 1965.

Jane L. Maxwell, *Associate Professor of Chemistry*, (Mount Holyoke College), B.S., Randolph-Macon Woman's College, 1945; M.S., Delaware, 1947; Ph.D., Emory University, 1957.

Barbara H. Offenhartz, *Assistant Professor of Chemistry*, (Mount Holyoke College), B.A., Swarthmore, 1958; Ph.D., University of Pennsylvania, 1963.

Peter O. Offenhartz, *Assistant Professor of Chemistry*, (Amherst College), B.A., Swarthmore, 1960; Ph.D., University of Pennsylvania, 1963.

G. Dann Sargent, *Assistant Professor of Chemistry*, (Amherst College), A.B., Middlebury, 1957; B.A., Oxford University, England, 1959; M.A., 1963, M.A., Harvard, 1963; Ph.D., 1964.

Kenneth Sherk, *Professor of Chemistry*, (Smith College), A.B., Reed College, 1928; Ph.D., Cornell, 1934.

Marc S. Silver, *Associate Professor of Chemistry*, (Amherst College), A.B., Harvard, 1955; Ph.D., California Institute of Technology, 1959.

Richard A. Snellgrove, *Assistant Professor of Physics*, (Amherst College), B.S., Amherst, 1959; Ph.D., Wisconsin, 1965.

Milton D. Soffer, *Professor of Chemistry*, (Smith College), B.S., University of Arkansas, 1937; A.M., Harvard, 1939; Ph.D., 1942.

Edwin S. Weaver, *Associate Professor of Chemistry*, (Mount Holyoke College), B.S., Yale, 1954; Ph.D., Cornell, 1959.
 Robert B. Whitney, *Professor of Chemistry*, (Amherst College), B.A., Minnesota, 1924; Ph.D., 1927.
 Kenneth L. Williamson, *Professor of Chemistry*, (Mount Holyoke College), B.S., Harvard, 1956; Ph.D., Wisconsin.

UNIVERSITY OF MASSACHUSETTS/BOSTON GRADUATE FACULTY

Joseph S. Alper, *Assistant Professor of Chemistry*, A.B., Harvard, 1963; Ph.D., Yale, 1968.

Jean-Pierre Anselme, *Professor of Chemistry*, B.A., St. Martial College, B.S., Fordham University, 1959; Ph.D., Polytechnic Institute of Brooklyn, 1963.

Ernest I. Becker, *Professor of Chemistry*, B.S., Western Reserve University, 1941; M.S., 1943; Ph.D., 1946.

Robert L. Gelb, *Assistant Professor of Chemistry*, B.S., Brooklyn Polytechnic Institute, 1963; Ph.D., Wisconsin, 1966.

Peter A. Hurwitz, *Assistant Professor of Chemistry*, B.S., Massachusetts Institute of Technology, 1961; M.A., Brandeis University, 1964; Ph.D., 1966.

Joseph E. Kroll, *Assistant Professor of Chemistry*, B.S., Queens College, 1949; M.S., Polytechnic Institute of Brooklyn, 1960; Ph.D., 1968.

Daniel E. Laufer, *Assistant Professor of Chemistry*, B.S., Massachusetts Institute of Technology, 1959; Ph.D., Brandeis University, 1964.

Walter J. Lehmann, *Associate Professor of Chemistry*, A.B., Washington University, 1950; Ph.D., St. Louis University, 1954.

Thomas N. Margulis, *Associate Professor of Chemistry*, B.S., Massachusetts Institute of Technology, 1959; Ph.D., University of California (Berkeley), 1962.

Lowell M. Schwartz, *Associate Professor of Chemistry*, B.S., Massachusetts Institute of Technology, 1956; M.S., California Institute of Technology, 1957; Sc.D.,

Massachusetts Institute of Technology, 1959.

Chi-Hua Wang, *Associate Professor of Chemistry*, B.S., St. John's University, 1945; M.S., Catholic University, 1947; Ph.D., St. Louis University, 1951.

Walter E. Weibrecht, *Assistant Professor of Chemistry*, B.S., Franklin and Marshall College, 1959; Ph.D., Cornell, 1963.

Leverett J. Zompa, *Assistant Professor of Chemistry*, B.S., Merrimack College, 1959; M.S., College of the Holy Cross, 1960; Ph.D., Boston College, 1964.

The Department of Chemistry provides facilities for students intending to complete the requirements for the Master's degree and the Doctor's degree. Students accepted for graduate study are expected to have met the usual requirements for the Bachelor's degree. Those who have not fulfilled these requirements may be admitted as special students until the deficiencies have been removed.

First-year graduate students will take placement examinations during the first week of residence. These examinations are for the purpose of evaluating the background of the student, and to assist in the selection of a course of study. Students are admitted to candidacy for a degree only after the completion of qualifying requirements. A research problem is carried out in one of the following fields of chemistry: physical, organic, inorganic, and analytical.

The department requires that all doctoral candidates pass a departmental examination showing that they possess reading knowledge in German, Japanese or Russian sufficient to understand journal material.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

701. ADVANCED ANALYTICAL CHEMISTRY.

Laboratory consisting of special work to meet the needs of the individual students. Prerequisite, Chem 513 or equivalent.

Credit, 1-5. Analytical Staff.

706. APPLIED ANALYTICAL
CHEMISTRY.

The application of basic analytical principles and techniques to the solution of actual analytical problems. The interrelationship between the diverse analytical approaches, as applied to organic, inorganic, qualitative and quantitative problems.

Prerequisite, Chem 513.

Credit, 3. Mr. Siggia.

710. ELECTROANALYTICAL
CHEMISTRY.

Principles of electrochemistry and their relation to the newer electroanalytical methods. Prerequisite, Chem 513 or equivalent; co-requisite, Chemistry 701 or permission of instructor.

Credit, 3. Mr. Curran, Mr. Olver.

741. INORGANIC PREPARATIONS
LABORATORY.

Preparation and testing of various types of inorganic substances, to teach important techniques and give familiarity with the reactions and properties of inorganic materials.

Credit, 3-5. Staff.

742. INORGANIC CHEMISTRY OF
THE LESS FAMILIAR
ELEMENTS.

Lectures and collateral reading on the descriptive chemistry of some of the less familiar elements such as boron, gallium, indium, thallium, the lanthanides, fluorine, titanium, vanadium, tantalum, tungsten, and uranium, with correlations between structure or spatial configurations and chemical properties.

Credit, 3. Staff.

747. STRUCTURAL INORGANIC
CHEMISTRY.

Applications of principles of spectroscopy, magnetic resonance and dielectrics toward an understanding of structural aspects of inorganic substances in the gas, liquid and solid states. Discussion of symmetry, stereochemically non-rigid molecules, metal carbonyl compounds, hydrogen bonding, unusual coordination compounds, solid state effects.

Prerequisite, Chem 546 or equivalent.

Credit, 3. Mr. Holmes.

748. COORDINATION CHEMISTRY.

Molecular orbital bonding theory, spectroscopy, magnetism, stereochemistry, and reaction mechanisms as applied to coordination species. Emphasis on transition elements.

Prerequisite, Chem 546 or equivalent.

Credit, 3. Mr. Archer.

756. TOPICS IN INORGANIC
CHEMISTRY.

Topics such as coordination chemistry, non-aqueous solvents, less familiar oxidation states, acid base theories, reaction mechanisms, etc.

Prerequisite, Chem 546 or equivalent.

Credit, 2 each semester.

Maximum credit, 6. Staff.

760. ORGANIC REACTION
MECHANISMS.

A broad survey of organic reactions with the inter-relationship of structure and mechanism as its theme.

Prerequisite, Chem 571 or permission of instructor.

Credit, 3. Staff.

761. PHYSICAL ORGANIC
CHEMISTRY.

Lectures on physical and theoretical chemistry as applied to organic compounds and reactions.

Prerequisite, Chem 760 or permission of instructor.

Credit, 3. Staff.

765. ADVANCED ORGANIC
CHEMISTRY LABORATORY.

More difficult synthesis of organic compounds, frequently those desired as starting materials for research, assigned to the individual student. Their preparation requires the use of the original literature.

Prerequisite, a year course in Organic Chemistry.

Credit, 3-5. Staff.

770. HETEROCYCLIC CHEMISTRY.

The chemistry of the common organic heterocyclic compounds containing nitrogen, oxygen, and sulfur. Consideration of mechanisms of the reactions discussed.

Prerequisite, Chem 571 or equivalent.

Credit, 3. Mr. McEwen.

771. ORGANOMETALLIC
CHEMISTRY.

The chemistry of compounds containing carbon-metal and carbon-metalloid bonds. Preparation, structure, physical properties, chemical reactions, and synthetic applications of organometallic derivatives. Topics of current interest stressed.

Prerequisite, Chem 571 or equivalent.

Credit, 3. Mr. Rausch.

772. CHEMISTRY OF NATURAL
PRODUCTS.

Natural products of current interest, primarily from the steroid, terpene, and alkaloid groups, with emphasis on structural proofs, stereochemistry, synthesis, and biogenetic relationships.

Prerequisite, Chem 571 or permission of instructor.

Credit, 3. Mr. McWhorter.

775. SPECIAL TOPICS IN
ORGANIC CHEMISTRY.

One to three topics of current interest discussed in detail. Recent development of theoretical and/or synthetic importance to organic chemistry. Maximum of six credits.

Prerequisite, Chem 571 or permission of instructor.

Three class hours. *Credit, 3. Staff.*

776. ORGANIC SYNTHESIS.

A survey of methods of organic synthesis, with emphasis on recent developments and on practice in devising syntheses of complex molecules.

Prerequisite, Chem 571. *Credit, 3. Staff.*

785. STATISTICAL THERMO-
DYNAMICS.

Introduction to Statistical Thermodynamics. Applications of Microcanonical, Canonical, Grand Canonical and Generalized Ensembles to chemical systems. Calculation of thermodynamic functions from spectroscopic data, fluctuations, imperfect gases, nearest neighbor lattice statistics and other special topics of current interest.

Prerequisite, Chem 595 or equivalent.

Credit, 3. Staff.

787. CHEMICAL SPECTROSCOPY,
TECHNIQUE AND
APPLICATIONS.

Introduction to the elementary theory, ex-

perimental techniques and interpretation of data obtained in applications of infrared, Raman, visible, ultraviolet, nuclear quadrupole and nuclear magnetic resonance spectroscopy to the solution of chemical problems.

Prerequisite, Chem 586 or equivalent.

Credit, 3. Mr. Stengle, Mr. Stidham.

788. CHEMICAL SPECTROSCOPY
THEORY.

Introduction to the theory of infrared, Raman, visible and ultraviolet, nuclear quadrupole and nuclear magnetic resonance spectroscopy.

Prerequisites, Chem 787 and permission of instructors.

Credit, 3. Mr. Stidham. Mr. Stengle.

791, 792. QUANTUM CHEMISTRY.

Quantum mechanics and its application to chemical problems. The exact theory of structure of simple atoms, the application of approximate methods for complex atoms and molecules, the chemical bond, resonance, the interaction of radiation and matter, group theory.

Prerequisite, Chem 546 or equivalent.

Credit, 3 each semester. Staff.

793, 794. X-RAY CRYSTAL-
LOGRAPHY.

Crystal symmetry, the diffraction of x-rays and the powder method as a tool for identification and determination of unit-cell constants. Intensities and some factors affecting them; space groups and systematic extinctions; single crystal diffraction methods; refinement of crystal structures; methods of obtaining trial structures.

Prerequisite, Chem 281 or equivalent.

Credit, 3 each semester. Staff.

795. TOPICS IN PHYSICAL
CHEMISTRY.

Prerequisites, Chem 595 and 546 or equivalent.

Credit, 2. each semester.

Maximum Credit, 6. Staff.

797. ORGANIC POLYMERIZATION
REACTIONS.

Mechanisms, kinetics, and thermodynamics of principal types of polymerization reac-

tions and relationship to the properties or resulting polymers.

Prerequisites, Chem 166 or equivalent.

Credit, 3. Mr. Lenz.

798, 799. PHYSICAL CHEMISTRY OF HIGH POLYMERS.

Structure of solid polymers, determination of molecular weights, sizes and shapes, mechanical properties of solid polymers, colligative properties of polymer solutions, polyelectrolytes, and physical chemistry of proteins.

Prerequisite, Chem 785 or equivalent.

Credit, 3 each semester.

Mr. Stein, Mr. Macknight.

891. SEMINAR.

Conferences, reports or lectures.

Credit, 1 each semester.

Maximum Credit, 2. Staff.

895. RESEARCH PROBLEM.

The student will prepare two proposals for research problems not directly related to his thesis topic if the latter has been selected. The problems will involve primarily library research.

Credit, 4. Staff.

800. MASTER'S THESIS.

Credit, 10.

900. DOCTORAL DISSERTATION.

Credit, 30.

COURSES OPEN TO BOTH GRADUATE AND UNDER- GRADUATE STUDENTS

(For either major or minor credit)

513. INSTRUMENTAL ANALYSIS.

Theory and practice of modern analyses utilizing optical, electrical and thermal properties. Selected modern separation methods may also be included.

Two class hours, one 4-hour laboratory period.

Prerequisites, Chem 210 and 586.

Credit, 3. Staff.

515. THEORY OF ANALYTICAL PROCESSES.

Detailed consideration of analytical topics such as chemical equilibrium, precipitate

formation, chelating agents, multistage separation, etc., having general applicability in chemical investigations.

Three class hours, laboratory optional (1 extra credit).

Prerequisite, Chem 166 and 586.

Credit, 3-4. Staff.

516. CHEMICAL MICROSCOPY.

Optics of the microscope, micrometry, microscopic study of fibers, crystals, physiochemical phenomena, qualitative analysis, and an introduction to electron microscopy.

Prerequisite, Chem 513 or permission of instructor.

Two 3-hour laboratory periods.

Credit, 2. Mr. Roberts.

517. MICROQUANTITATIVE ANALYSIS.

Quantitative determination of carbon, hydrogen, oxygen, nitrogen, sulfur, halogens, phosphorous. Both organic and inorganic compounds will be included in microgram scale analyses.

Prerequisite, Chem 513 or permission of instructor.

One 4-hour laboratory period.

Credit, 1. Mr. Meade.

519. ELECTRONICS INSTRUMENTATION FOR SCIENTISTS.

Laboratory oriented course designed for scientists which begins with electronic principles and leads through servo-systems, operational amplifiers, digital circuits, and other measurement devices.

One class hour, one 4-hour laboratory period.

Prerequisites, one year of physics and permission of instructor.

Credit, 3. Mr. Barnes, Mr. Curran.

544. RADIOCHEMISTRY.

Character of atomic nuclei, nuclear reactions, radiation and its detection, and techniques for the study and utilization of radio-nuclides.

Three class hours, one 3-hour laboratory period.

Prerequisite, Chem 210 or 127 or permission of instructor.

Credit, 4. Mr. Richason

546. THEORETICAL INORGANIC
CHEMISTRY.

Survey of theoretical aspects of inorganic chemistry chosen from such topics as electronic structure and its relation to periodic properties, chemical bonding, molecular structure, coordination chemistry, acid-base theory, non-aqueous systems, and reaction mechanisms.

Prerequisite, Chem 585. *Credit, 3. Staff.*

547. INORGANIC CHEMISTRY OF
THE COMMON ELEMENTS.

Systematic consideration of the chemistry of the common elements and their compounds, based on the periodic relationships and modern concepts of structure and bonding. An optional two-credit laboratory will provide an introduction to inorganic laboratory techniques and practices.

Three class hours (6 lab hours optional). Prerequisite, Chem 546 or permission of instructor. *Credit, 3. (5). Mr. Zajicek, Mr. Chandler.*

571. ADVANCED ORGANIC
CHEMISTRY.

An intensive survey of aliphatic and aromatic chemistry with emphasis on scope and limitations of reactions, mechanisms, and recent developments.

Prerequisites, one year of organic chemistry and permission of instructor.

Credit, 3. Staff.

572. IDENTIFICATION OF
ORGANIC COMPOUNDS.

Identification of unknowns, both single and mixtures of organic compounds, by their reactions, preparation of derivatives, spectra and other physical properties.

Two class hours, two 3-hour laboratory periods.

Prerequisites, one year of organic chemistry and permission of instructor.

Credit, 4. Staff.

590. ADVANCED PHYSICAL
CHEMISTRY.

Survey of modern physical chemistry with emphasis on the fundamentals of quantum mechanics and statistical mechanics. For students not taking further advanced work in these areas.

Prerequisite, Chem 586. *Credit, 3. Staff.*

595. ADVANCED PHYSICAL
CHEMISTRY.

Topics such as chemical thermodynamics, statistical mechanics, introductory quantum chemistry and theories of gases, liquids and solids.

Prerequisite, Chem 586. *Credit, 3. Staff.*

COURSES NOT FOR MAJOR
CREDIT

(No graduate credit for students majoring in Chemistry)

561, 562. ORGANIC CHEMISTRY.

Introduction to the chemistry of carbon compounds. Survey of the principal classes of organic compounds and their reactions with emphasis on the relation between structure and reactivity.

Prerequisite, Chem 112.

Credit, 3 each semester. Staff.

563, 564. ORGANIC CHEMISTRY
LABORATORY.

Application of the experimental techniques of organic chemistry to the preparation, purification and identification of organic compounds.

One 3-hour laboratory period.

Prerequisite, concurrent enrollment in Chem 561, 562.

Credit, 1 each semester. Staff.

580. ELEMENTARY PHYSICAL
CHEMISTRY LABORATORY.

One 3-hour laboratory period.

Prerequisite, concurrent enrollment in Chem 582.

Credit, 1. Staff.

581. ELEMENTARY PHYSICAL
CHEMISTRY.

Basic principles of physical chemistry designed for students with a limited mathematical background. Not open to chemistry Prerequisites, Chem 112; Physics 142, Math 124.

Credit, 3. Staff.

582. ELEMENTARY PHYSICAL
CHEMISTRY.

Continuation of Chemistry 581.

Two class hours.

Credit, 2. Staff.

585, 586. PHYSICAL CHEMISTRY.

Fundamental theories and laws of physical chemistry.

Prerequisites, Math 174 and Physics 142.

Continuation of Chemistry 581.

Credit, 3 each semester. Staff.

587, 588. PHYSICAL CHEMISTRY

LABORATORY.

Experience in modern physicochemical techniques.

Concurrent enrollment in Chem 585, 586 required.

Credit, 2 each semester.

Mr. Stidham and Staff.

Civil Engineering

GRADUATE FACULTY

Merit P. White, *Commonwealth Head of the Department and Professor of Civil Engineering*, A.B., Dartmouth, 1930; C.E. 1931; M.S.C.E., California Institute of Technology, 1932, Ph.D., 1935.

Donald D. Adrian, *Associate Professor of Civil Engineering*, B.A., Notre Dame, 1957; B.S., 1958; M.S., California at Berkeley, 1959; Ph.D., Stanford University, 1964.

Robert R. Archer, *Professor of Civil Engineering*, S.B., Massachusetts Institute of Technology, 1952; Ph.D., 1956.

Stanley M. Bemben, *Associate Professor of Civil Engineering*, B.S., Massachusetts, 1956; M.S., Illinois, 1958; Ph.D., Cornell, 1966.

Bernard B. Berger, *Professor of Civil Engineering*, B.S., Massachusetts Institute of Technology, 1935; M.S., Harvard, 1948.

William W. Boyer, *Professor of Civil Engineering*, B.S.C.E., North Carolina State, 1947; M.S.C.E., 1950.

Charles E. Carver, Jr., *Professor of Civil Engineering*, B.S.C.E., Vermont, 1947; M.S.C.E., Massachusetts Institute of Technology, 1949; Sc.D., 1955.

Alexander Chajes, *Associate Professor of Civil Engineering*, B.S.C.E., Cooper Union, 1952; M.S.C.E., Polytechnical Institute, 1955; Ph.D., Cornell, 1964.

Joseph M. Colonell, *Associate Professor*

of Civil Engineering, B.S.C.E., Colorado, 1958; M.S.C.E., Washington State, 1960; Ph.D., Stanford, 1966.

Francis A. DiGiano, *Assistant Professor of Civil Engineering*, B.S.C.E., Massachusetts, 1964; M.S.C.E., Tufts, 1965; Ph.D., Michigan, 1969.

Frederick J. Dzialo, *Associate Professor of Civil Engineering*, B.S.C.E., Massachusetts, 1954; M.S.C.E., 1957; Ph.D., Rensselaer Polytechnic Institute, 1965.

Tsuan H. Feng, *Professor of Civil Engineering*, B.S.C.E., Pei-Yang University, China, 1940; M.S.C.E., Wisconsin, 1946; Ph.D., 1950.

Denton B. Harris, *Assistant Professor of Civil Engineering*, B.S.C.E., Massachusetts, 1952; M.S.C.E., 1953.

Karl N. Hendrickson, *Professor of Civil Engineering*, B.S.G.E., Maine, 1938; B.S.C.E., 1949; M.S.C.E., 1941.

William E. Heronemus, *Professor of Civil Engineering*, B.S., United States Naval Academy, 1941; M.S., Massachusetts Institute of Technology, 1948.

George R. Higgins, *Associate Professor of Civil Engineering*, B.S.C.E., New Hampshire, 1948; M.S., Massachusetts Institute of Technology, 1951.

Lawrence N. Kuzminski, *Assistant Professor of Civil Engineering*, B.A., Toronto, 1962; M.A., 1964; Ph.D., Massachusetts, 1967.

Peter A. Mangarella, *Assistant Professor of Civil Engineering*, B.S.C.E., Carnegie-Mellon University, 1965; M.S.C.E., Stanford, 1966; Ph.D., 1970.

Melton M. Miller, Jr., *Associate Professor of Civil Engineering*, B.S.C.E., Vermont, 1955; M.S.C.E., Purdue, 1958; Ph.D., 1964.

William A. Nash, *Professor of Civil Engineering*, B.S.C.E., Illinois Institute of Technology, 1944; M.S., 1946; Ph.D., Michigan, 1949.

Elmer C. Osgood, *Professor of Civil Engineering*, C.E., Rensselaer Polytechnic Institute, 1928; D. Eng., 1931.

Fred D. Stockton, *Associate Professor of Civil Engineering*, B.S.C.E., Alabama, 1942; M.S., Brown, 1949; Ph.D., 1953.

Roscoe F. Ward, *Associate Professor of Civil Engineering*, B.A., College of Idaho, 1953; B.S.C.E., Oregon State College, 1959; M.S., Washington State University, 1961; Sc.D., Washington University, 1964.

The Department offers the Ph.D. and Master of Science in Civil Engineering, and the Ph.D. and Master of Science in Environmental Engineering and Ocean Engineering. The degrees in Civil Engineering are normally restricted to candidates with undergraduate engineering training, whereas the Environmental Engineering degrees are offered to students with either engineering or non-engineering backgrounds. Details on the Environmental Engineering and Ocean Engineering (courses designated as (OE) after the department description in this section refer to Ocean Engineering courses) programs are found elsewhere in this bulletin under that heading.

The requirements for the Master of Science in Civil Engineering degree are 30 graduate credits, six of which may be a thesis, and enrollment in one of the following options: Environmental Engineering, Fluid Mechanics, Solid Mechanics, Soil Mechanics and Foundations, Structures, and Transportation Engineering.

Each option contains a core of either four or five required courses. The general requirements for the degree of Doctor of Philosophy with a major in Civil Engineering are specified by the Graduate School. In addition, three approved courses in the humanities and/or social sciences (including foreign languages) are required. Grades of C or better are necessary.

COURSES OPEN TO GRADUATE STUDENTS ONLY

700. SPECIAL PROBLEMS.

Credit, 3-6. Staff.

710. TRANSPORTATION ANALYSIS AND PLANNING.

Analysis of traffic and transportation engineering problems in highways, railroads and

airports and the planning related to those facilities.

Prerequisite, CE 720.

Credit, 3. Mr. Boyer, Mr. Webster.

715. PAVEMENT DESIGN.

The theory of flexible and rigid pavement design: soil conditions, joints, base and sub-grade material and mix.

Credit, 3. Mr. Boyer.

716. TRANSPORTATION DESIGN.

Design of the visible elements of the roadway. Fundamental design controls and elements with application to rural and urban roads. *Credit, 3. Mr. Boyer, Mr. Webster.*

720. THEORETICAL SOIL MECHANICS.

The phenomena in soil masses subjected to such forces as seepage, frost imposed loads.

Credit, 3. Mr. Bemben.

721. APPLIED SOIL MECHANICS.

Solution of case problems applying the principles of soil mechanics to the design of embankments, retaining walls, footings, raft foundations, and pile structures.

Prerequisite, CE 720.

Credit, 3. Mr. Bemben, Mr. Hendrickson.

722. SEEPAGE ANALYSIS.

Analytical study of ground water and seepage problems related to each structures.

Prerequisite, permission of instructor.

Credit, 3. Mr. Hendrickson.

723. SHEAR STRENGTH OF SOILS.

Survey of current theory and research regarding the shear strength of soils.

Credit, 3. Mr. Bemben.

724. SUBMARINE SOIL MECHANICS AND FOUNDATION ENGINEERING (OE 761).

Exploration of marine sediments, the assessment of the geotechnical properties and methods for altering the properties of marine sediments; submarine slope stability; foundation design factors for structures on and in marine sediments.

Three class hours.

Prerequisite, CE 220.

Credit, 3. Mr. Bemben.

730. PLASTIC DESIGN.

Plastic analysis and design of steel frames.
Prerequisites, CE 331 and 532.

Credit, 3. Mr. Osgood.

734. NUMERICAL METHODS IN STRUCTURAL MECHANICS.

Application of numerical methods to the solutions of problems of structural mechanics. The method of finite differences as well as Holtzer's method, Vianello-Stodola method and other appropriate methods are presented.

Prerequisites, Math 585 (concurrently), Comp Sci 551 or permission of instructor.

Credit, 3. Mr. Miller, Mr. Stockton.

737. COASTAL STRUCTURES (OE 764).

Factors influencing the loading, performance, and durability of coastal structures; resistance of construction materials to deterioration; design of waterfront and offshore structures.

Three class hours.

Prerequisites, CE 232, 331, and 333.

Credit, 3. Mr. Osgood.

738. ANALYSIS AND DESIGN OF OFFSHORE STRUCTURES (OE 765).

Structural design of offshore structures such as buoys, towers, bridges, artificial islands, tunnels, and other special structures. Functional design considerations and methods of construction.

Three class hours.

Prerequisites, CE 559, 534, and 540.

Credit, 3. Mr. Miller.

741. STRUCTURAL DYNAMICS.

Behavior of linear and non-linear mechanical systems subjected to periodic forces, to non-periodic forces and to shock loads.

Credit, 3. Mr. Chajes, Mr. Dzialo,
Mr. White.

742. EXPERIMENTAL STRESS ANALYSIS.

Experimental procedures for determination of stresses and strains due to static and dynamic loads. *Credit, 3.* Mr. Harris.

743. ELASTICITY.

General equations of the mathematical

theory of elasticity in space. Plane strain and plane stress in cartesian, polar and general orthogonal coordinates.

Credit, 3. Mr. Archer, Mr. Dzialo
and Mr. Nash.

744. THEORY OF PLATES AND SHELLS.

Classical theory of plates as well as modern developments. Relationship of the general theory of elasticity to plate theory. An introduction to shell theory.

Credit, 3. Mr. Dzialo and Mr. Nash.

745. STRUCTURAL STABILITY.

Linear and non-linear buckling of columns, frames, plates and shells; elastic, inelastic and finite deformation theories. Exact solutions and approximate solutions by energy and finite difference methods.

Credit, 3. Mr. Chajes and Mr. Nash.

746. SEISMIC ANALYSIS OF STRUCTURES.

Principles of engineering seismology including the analysis and design of structures to resist earthquake motions.

Prerequisite, CE 741.

Credit, 3. Mr. Chajes, Mr. Dzialo,
Mr. Nash and Mr. White.

751. FLUID MECHANICS OF THE OCEANS (OE 711).

Oceanic physics with emphasis on those aspects which are of major engineering importance. Introduction of classical hydrodynamics and development of the Navier-Stokes equation for application to problems of oceanic scale.

Three class hours.

Prerequisites, CE 559 and 556.

Credit, 3. Mr. Colonell.

752. OCEAN WAVE THEORY (OE 712).

Classical theory of water waves, generation and propagation of waves at sea, observation and recording of waves, wave spectra and sea forecasting, tsunami propagation and detection.

Three class hours.

Prerequisites, CE 559 and 556.

Credit, 3. Mr. Colonell.

**757. THEORY OF HYDRAULIC
SIMILITUDE.**

Hydraulic similitude, dimensional analysis, methods of obtaining dynamic similarity in hydraulic models in actual practice, analysis of typical hydraulic models.

Prerequisite, CE 257.

Credit, 3. Mr. Carver.

763. SUBSURFACE HYDROLOGY.

Interrelation of surface and subsurface hydrology. Saturated and unsaturated flow in permeable media. Development and utilization of subsurface waters. Chemical, bacteriological and physical aspects of ground water quality. Deep well liquid wastes disposal.

Prerequisite, CE 660 or permission of instructor.

Credit, 3. Mr. Adrian.

**764. COASTAL ENGINEERING
(OE 777).**

Role of the environment in the planning, design, and operation of engineering works in coastal waters. Physical and biological aspects of pollution in estuaries and coastal inlets.

Prerequisites, CE 556 and 559 or permission of instructor

Credit, 3. Mr. Colonell.

**770. ENVIRONMENTAL ENGI-
NEERING DESIGN.**

Selection, evaluation, and design of environmental engineering processes and systems based on laboratory evaluations and pilot plant studies.

Prerequisites, CE 771 and 772.

Credit, 3. Mr. Lindsey.

**771. UNIT PROCESSES OF ENVI-
RONMENTAL ENGINEERING.**

Principles and application of biological and chemical processes in environmental engineering: aerobic and anaerobic biological oxidation, photosynthesis, composting, chemical precipitation, coagulation, disinfection, and dry and wet combustion.

Credit, 3. Mr. Feng.

**772. UNIT OPERATIONS OF ENVI-
RONMENTAL ENGINEERING.**

Principles and application of physical processes in environmental engineering: sedimentation and flotation, flow through filters,

gas transfer, adsorption and leaching, and evaporation and drying.

Credit, 3. Mr. Feng.

**774. ADVANCED WASTE
TREATMENT.**

The removal of pollutants from the liquid transport medium utilizing such processes and operations as reverse osmosis, distillation and sorption. Ultimate disposal of solid pollutants.

Prerequisites, CE 771 and 772.

Credit, 3. Mr. Lindsey, Mr. Ward.

**775. ENVIRONMENTAL SYSTEMS
SIMULATION.**

Theoretical and practical factors governing simulation in environmental engineering systems. Mathematical models of water resources, water supply, waste treatment and disposal systems. Simulation on analog and digital computers. Verification of models.

Prerequisites, Math 187, CE 270.

Credit, 3. Mr. Adrian.

**776. BIO-INSTRUMENTATION OF
ENVIRONMENTAL SYSTEMS.**

Instrumentation and analytical techniques for research on biological, biochemical and chemical systems influencing man's environment. Spectral theory and absorption spectroscopy, chromatographic and mass spectrographic analysis, automatic analysis instruments.

Prerequisite, CE 672 or equivalent.

Credit, 3. Mr. Kuzminski.

780. MECHANICS OF MATERIALS.

Advanced topics related to the mechanical behavior of structural materials.

Credit, 3. Mr. Harris.

**781. MATERIALS FOR SUBMARINE
STRUCTURES (OE 731).**

The response of materials subjected to high compressive loadings in the sea water medium; theory of deformation and fracture under high compressive stress; brittle-ductile transition in materials, stress corrosion, corrosion fatigue.

Three class hours.

Prerequisite, CE 580.

Credit, 3. Mr. Harris.

783. STRUCTURAL MECHANICS
OF DEEP SUBMERSIBLE
VEHICLES (OE 763).

Elastic and inelastic action of pressure hull structure for deep submersible vehicles. Presentation of design criteria for stiffened shells and plating common to such systems. Three class hours.

Prerequisites, CE 141 and CE 240, or MAE 246. *Credit, 3.* Mr. Nash and/or Mr. Heronemus.

792. DEEP OCEAN SYSTEMS
ENGINEERING AND DESIGN
II (OE 772.)

A continuation of systems engineering applied to deep ocean systems. The class, organized and operating as a multidisciplinary engineering team, execute engineering and design for one or more complete systems. Three class hours, one 3-hour laboratory period.

Prerequisite, CE 591.

Credit, 4. Mr. Heronemus.

793. PUBLIC POLICY AND THE
USE OF THE SEAS (OE 773).

Policies of the United States and other nations toward possession and use of the seas. Laws and agreements relating to jurisdiction in the marine frontier. Use of continental shelf, world-wide navigation systems, exploitation of natural resources, pollution of the oceans.

One class hour. *Credit, 1.* Mr. Heronemus.

794. FUNDAMENTALS OF NAVAL
ARCHITECTURE (OE 774).

Statics and dynamics of surface ships and submarines, hull shape, form and delineation, resistance, speed, power, propellers, longitudinal strength, transverse strength, steering and turning.

Three class hours, one 3-hour laboratory period. *Credit, 4.* Mr. Heronemus.

795. OCEAN ENGINEERING FIELD
LABORATORY I (OE 775).

Introduction to oceanographic measurements and field operations especially waves, currents, sea water characteristics, materials durability, and marine instrumentation techniques. Preliminary design of field engineering project.

Prerequisite, completion of Ocean Engineering core curriculum.

Credit, 3 (summer only). OE Staff.

796. OCEAN ENGINEERING FIELD
LABORATORY II (OE 776).

Design, fabrication, installation, and evaluation involved in ocean engineering. Emphasis will be on development of practical engineering approaches to problems in the ocean environment.

Prerequisite, CE 795.

Credit, 3 (summer only). OE Staff.

800. MASTER'S THESIS.

Credit, 6.

850, 851. SEMINAR.

Presentation by the graduate student of selected current literature and research. Visiting lecturers.

One class hour.

Credit, 1. Staff.

900. DOCTORAL DISSERTATION.

COURSES OPEN TO BOTH
GRADUATE AND UNDERGRADUATE
STUDENTS.

(For either major or minor credit)

522. SOIL TESTING.

Sampling and testing of soils for engineering purposes.

One class hour, two 3-hour laboratory periods.

Prerequisite, CE 220 or equivalent.

Credit, 3. Mr. Bemben.

523. SOIL MECHANICS FOR
TRANSPORTATION
ENGINEERING.

The application of the principles of soil mechanics to the field of Transportation Engineering. Principal topics include the evaluation of the stability of soils as subgrade and embankment materials; the role of the subgrade properties of soils on the design of pavements; and methods for improving the subgrade properties of soils.

Three class hours.

Prerequisite, CE 220.

Credit, 3. Mr. Bemben.

532. THEORY OF STRUCTURES II.

Analysis of statically indeterminate structures.

Three class hours.

Prerequisite, CE 230.

Credit, 3. Mr. Osgood.

534. THEORY OF
STRUCTURES III.

Analysis of complex or special structures.
Prerequisites, CE 331; 232; 333 concurrently.

Three class hours.

Credit, 3. Mr. Miller, Mr. Osgood.

535. MATRIX ANALYSIS OF
STRUCTURES.

Development and use of the flexibility and stiffness methods of matrix analysis for determinate and indeterminate structures.

Three class hours.

Prerequisite, CE 232.

Credit, 3. Mr. Chajes.

540. STRENGTH OF
MATERIALS II.

Calculation of stresses and strains in components of machines and structures.

Prerequisite, CE 141.

Credit, 3. Mr. White.

556. INTRODUCTION TO
HYDRODYNAMICS.

Mathematical treatment of basic theorems of classical hydrodynamics—potential flow, conformal mapping, wave and vortex motion.

Prerequisite, Math 186.

Credit, 3. Mr. Carver.

559. ENGINEERING OCEANOGRAPHY (OE 510).

Fluid mechanics problems of ocean and coastal engineering including currents, tides, surface waves, tsunami and seich phenomena, and ocean circulation.

Three class hours.

Prerequisite, CE 257.

Credit, 3. Mr. Colonell.

561. OPEN CHANNEL FLOW.

Steady flow in open channels including channel transitions and controls, sediment transport, and elementary design of related hydraulic structures.

Three class hours.

Prerequisite, CE 260.

Credit, 3. Mr. Higgins.

580. MATERIALS IN THE OCEAN
ENVIRONMENT (OE 530).

The response of structural materials to the ocean environment, theory of corrosion; abrasion; erosion and biological attack.

Three class hours.

Prerequisite, Marine Sci 525.

Credit, 3. Mr. Harris.

590. ENGINEERING DESIGN OF
OCEAN SYSTEM PAYLOAD
DEVICES (OE 570).

Techniques for augmentation of man's ability to measure, test, and synthesize the ocean environment through the development of tethered, towed, or stationary equipment. Topics include underwater photography, lighting, manipulative and prosthetic devices, data gathering equipment, and underwater equipment design.

Three class hours.

Prerequisite, Marine Sci 525.

Credit, 3. OE Staff.

591. DEEP OCEAN SYSTEMS
ENGINEERING AND
DESIGN I (OE 571).

Systems engineering applied to analysis and synthesis of systems capable of doing useful work in the deep oceans, with emphasis on design of deep submergence vessels.

Three class hours, one 3-hour laboratory period.

Credit, 4. Mr. Heronemus.

605. ADVANCED SURVEYING.

Elements of astronomical, geodetic and photogrammetric surveying; coordinate systems and map projections.

Two class hours, 1 3-hour laboratory period.

Prerequisite, CE 101.

Credit, 3. Mr. Boyer, Mr. Weidmann.

611. TRAFFIC ENGINEERING.

Engineering solutions to planning, design, and operations problems of urban and rural street and highway networks.

Two class hours, 1 3-hour laboratory period.

Prerequisite, CE 210.

Credit, 3. Mr. Boyer, Mr. Webster.

**634. ADVANCED TOPICS IN
CONCRETE.**

Design of various types of reinforced concrete building frames; elastic theory and ultimate strength procedures.

Three class hours.

Prerequisites, CE 232 and 333.

Credit, 3. Mr. Miller, Mr. Osgood.

660. HYDROLOGY.

The hydrologic cycle, including precipitation, runoff, ground water, flood routing, reservoir sedimentation, water law, and applications of hydrologic techniques to water resources engineering.

Three class hours.

Prerequisite, CE 260 or permission of instructor.

Credit, 3. Mr. Higgins.

**662. WATER RESOURCES
ENGINEERING.**

Planning and design of dams, reservoirs, and other related hydraulic structures, including analysis of existing and proposed water resources projects.

Three class hours.

Prerequisite, CE 260 or permission of instructor.

Credit 3 Mr. Higgins.

**665. WATER INSTITUTIONS
AND POLICIES.**

Public policies and laws relating to the use and conservation of water resources. Analysis of water-related governmental organizations at the federal, state and local levels.

Prerequisite, permission of instructor.

Credit, 3. Mr. Adrian, Mr. Berger.

**671. INDUSTRIAL WASTE
TREATMENT AND CONTROL.**

Composition of industrial effluents; pollution criteria and effects of industrial wastes on receiving waters; physical, chemical and biological methods and applications in treatment.

Two class hours, 1 3-hour laboratory period.

Prerequisite, permission of instructor.

Credit, 3. Mr. Ward.

**672. ENVIRONMENTAL
ENGINEERING ANALYSIS I.**

An application of chemical principles to environmental engineering analysis with specific reference to pollution indices.

Two class hours, 1 3-hour laboratory period.
Prerequisite, Chem 112.

Credit, 3. Mr. Kuzminski.

**673. ENVIRONMENTAL ENGI-
NEERING ANALYSIS II.**

The fundamental microbiological and biochemical properties of the micro-organisms important in environmental engineering practice.

Two class hours, 1 3-hour laboratory period.

Prerequisite, CE 372 or permission of instructor.

Credit, 3. Mr. Kuzminski.

**674. RADIOLOGICAL HEALTH
ENGINEERING.**

Basic principles and procedures pertaining to the safe control, use and disposal of common sources of ionizing radiation.

Credit, 3. Mr. Marcus.

**675. SURFACE WATER
QUALITY CONTROL.**

Evaluation and control of water quality in streams, lakes, and reservoirs. Mathematical analyses of patterns of water movement and their relation to water quality.

Credit, 3. Mr. Feng.

676. SOLID WASTES.

Production, collection, transportation, treatment, and disposal of solid waste products (including municipal, industrial, and agricultural wastes).

Prerequisite, permission of instructor.

Credit, 3. Mr. Kuzminski.

COURSES NOT FOR MAJOR CREDIT

(No graduate credit for students majoring in Civil or Environmental Engineering)

520. SOIL MECHANICS.

Engineering uses and mechanical properties of soils.

Two class hours, 1 3-hour laboratory period.

Credit, 3. Mr. Hendrickson.

**571. INTRODUCTION TO
ENVIRONMENTAL POLLUTION
CONTROL.**

Basic engineering aspects of environmental pollution control.

Three class hours. *Credit, 3. Mr. Feng.*

Classics

(See Department of French for Graduate Faculty)

Although the University does not offer advanced degrees specifically in Classics, graduate-level Latin courses are available as electives for students enrolled in other programs and are especially recommended as background for students in Comparative Literature, English, History, and modern foreign languages. Intensive elementary courses in the Greek and Latin languages are open to graduate students on a no-credit basis (consult the undergraduate Course and Faculty Directory).

The degree of Master of Arts in Teaching may be earned in Latin and Classics by pursuing a carefully coordinated program of studies involving work in Education as well as in the subject matter field. Normally 12 credits are taken in Education and 24 in Classics (up to 6 credits may be earned for the optional Master's thesis). This program is open both to those desiring certification to teach Latin in secondary schools and to present teachers of Latin who wish to deepen their knowledge of ancient language, literature, and civilization and to explore new methods and materials in ancient art, history, philosophy, and in comparative literature. Students may supplement their work at the University with approved courses at the neighboring colleges (Amherst, Mount Holyoke, and Smith) under the Five College Cooperation Program. Supervised practice teaching is done in area high schools.

COURSES OPEN TO GRADUATE STUDENTS ONLY

700. SPECIAL PROBLEMS.

Directed study of some problem in Latin language or literature. May be repeated for credit. *Credit, 2-6.*

790. SEMINAR.

Intensive, advanced study of some aspect of Latin literature. *Credit, 3-6.*

800. MASTER'S THESIS.

Maximum credit, 9.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

607. THE TEACHING OF LATIN IN SECONDARY SCHOOLS.

Examination and evaluation of various methods of teaching Latin in secondary schools, with actual experience teaching in the classroom and discussion of special problems. *Credit, 3-6.*

(The following courses are offered in rotation)

625. THE LATIN POLITICAL TRACT.

Selections from Sallust and Caesar accompanied by an historical and literary analysis of their works. *Credit, 3.*

626. LATIN DIDACTIC EPIC.

Selections from Lucretius, Vergil's *Georgics*, Ovid's *Ars amatoria* and *Metamorphoses*. *Credit, 3.*

627. LATIN HISTORY AND BIOGRAPHY.

Selections from Livy, Tacitus, and Suetonius. *Credit, 3.*

628. LATIN DRAMA.

Selected plays of Plautus, Terence, and Seneca. *Credit, 3.*

629. LATIN ESSAYS AND LETTERS.

The Roman mind as revealed in the philosophical works of Cicero and the moral epistles of Seneca; Roman private life and personal concerns as revealed in the letters of Cicero and Pliny. *Credit, 3.*

630. LATIN ELEGIAC POETRY.

Selections from Catullus, Tibullus, Propertius, and Ovid. *Credit, 3.*

633. VERGIL'S AENEID.

The entire poem, with attention to traditional and contemporary critical perspectives and evaluations. *Credit, 3.*

Comparative Literature

INTERDEPARTMENTAL

GRADUATE FACULTY

Warren D. Anderson, *Chairman of the Program and Professor of Comparative Literature*, B.A., Haverford, 1942; B.A., Oxford, 1949; M.A., Harvard, 1947; Ph.D., 1954.

Eric M. Beekman, *Associate Professor of Germanic Languages and Literature and Comparative Literature*, A.B., California at Berkeley, 1963; Ph.D., Harvard, 1968.

Sarah Lawall, *Associate Professor of French*, B.A., Oberlin, 1956; Ph.D., Yale, 1961.

Paul A. Mankin, *Associate Professor of French*, B.A., California at Los Angeles, 1948; M.A., 1953; Ph.D., Yale, 1959.

Lucien M. Miller, *Assistant Professor of Comparative Literature*, B.A., California at Berkeley, 1961; M.A., 1963; Ph.D., 1970.

C. William Moebius, *Assistant Professor of Comparative Literature*, B.A., Lawrence (Wis.), 1963; Ph.D., S.U.N.Y. at Buffalo, 1969.

Alex Page, *Professor of English*, B.A., Vermont, 1948; M.A., Harvard, 1949; Ph.D., 1953.

Irmina L. Plaszkiewicz-Pulc, *Assistant Professor of Comparative Literature*, B.A., Mt. Holyoke, 1958; M.A., Radcliffe, 1959; Ph.D., Harvard, 1964.

Irving P. Rothberg, *Professor of Spanish*, B.S., Temple University, 1948; M.A., Pennsylvania State, 1951; Ph.D., 1954.

Eva Schiffer, *Associate Professor of German*, B.S., Massachusetts, 1946; M.A., Radcliffe, 1947; Ph.D., 1964.

Robert E. Taylor, *Director of Graduate French*, B.A., Reed College, 1943; M.A., *Romance Languages and Professor of French*, B.A., Reed College, 1943; M.A., Columbia, 1947; Ph.D., 1951.

The Program in Comparative Literature offers graduate work leading to the

Master of Arts and Doctor of Philosophy degrees. Facilities and staff for concentrants in classical tradition studies, medieval, Renaissance, Enlightenment, romantic, modern and contemporary European literature are available. Graduate training prepares students for University teaching and research, as well as for the teaching of general and world literature courses at the college level. Graduate courses in Comparative Literature are open to students in other language-literature programs for minor credit.

1. *Prerequisites for Admission to either the M.A. or Ph.D. Program* (beyond the usual requirements of the Graduate School): A B.A. degree either with a major in a language-literature field or awarded upon completion of substantial literary studies; completion of at least two years of undergraduate work in two modern languages other than English, one of which should be French or German, with a grade of B or better (deficiencies on this account to be made up no later than the student's fourth semester of study); reasonable fluency in English for students not native to the language. Students who do not, in addition, have a reading knowledge of Greek or Latin will ordinarily terminate with the M.A.

2. *The M.A. in Comparative Literature* The main purpose of the M.A. is to provide the student with a critical and historical ordering principle for his previous and ongoing literary work.

A. *Program of Study*: Thirty credit hours of graduate work in literature, of which at least twelve must be at the 700-900 level, and of which at least nine must be in courses formally labeled "Comparative Literature." These last will ordinarily include a methods course and a course on the theory of literary criticism. Ordinarily, a student will elect no more than twelve hours (four courses) from the offerings of any one language-literature course block. One 200-level course in non-Western literature in translation (African, Chinese, Japanese) may count for graduate credit.

B. *Examinations*: For terminal candidates, a general oral examination will be

administered within the last two weeks of class in the semester.

C. *Thesis*: None required.

3. *The Ph.D. in Comparative Literature*

A. *Program of Study*: Ordinarily, course work for the Ph.D. should be balanced among the candidate's major literature, minor literatures, and training in Comparative Literature proper, in a percental proportion of 40%-20%-10%-30%. Thus a minimal program might involve eight courses in Literature 1, four courses in Literature 2, two courses in Literature 3, and six courses from the Comparative Literature course block. In balancing out a student's program, guidance committees will keep the following three criteria in mind:

(1) Work in Literature 1 should attempt historical coverage, including at least one philological course concerned with earlier forms of the literary language.

(2) Work in Literatures 2 and 3 should attempt to cover in depth literary phenomena from the historical sphere of special interest to the candidate.

(3) Work from the Comparative Literature block should include at least one course dealing with the candidate's special field of interest, one course in methodology, and one course in the history or theory of criticism.

NOTE: The Ph.D. is seen here as an integral whole, stretching from the B.A. to the dissertation stage, rather than by way of a post-magisterial program.

B. *Languages*: Competence at level (1) in two languages, one of which must be French or German.

Competence at level (2) in a third language. For candidates not offering a major classical language at level (1), this third language will usually be Latin, or Classical Greek, with competence to be tested no later than the candidate's fourth semester of graduate study.

C. *Examinations*:

(1) Upon successful completion of the course program outlined by the candidate's guidance committee and upon ful-

filment of the language requirement, the candidate must pass a written and oral preliminary examination geared in terms of balance to the proportions of his plan of study (normative balance: 4 hours for the major; 2 hours for each minor—Overall oral: 2 hours).

(2) Upon the acceptance of a candidate's dissertation, he must pass an oral final examination.

D. *Dissertation*: A scholarly or critical dissertation is required of all candidates.

COURSES OPEN TO GRADUATE STUDENTS ONLY

700. SPECIAL PROBLEMS.

Directed study of some problem in Comparative Literature. May be repeated for credit. *Credit, 2-6.*

701. BIBLIOGRAPHY AND METHODS OF LITERARY RESEARCH.

Introduction to the bibliography and methodology of comparative studies in literature. *Credit, 3.* Miss Schiffer.

702. LITERARY CRITICISM I: PLATO TO SAMUEL JOHNSON.

A survey of Occidental literary criticism and critical theory from the beginnings to Neo-Classicism. *Credit, 3.* Mr. Schroeder.

703. LITERARY CRITICISM II: INTRODUCTION TO HISTORY OF CONSCIOUSNESS.

Deals with modern crises of consciousness, ethics, and form as manifested in seminal works of avant-garde criticism and fiction. *Credit, 3.*

704. CONTEMPORARY THEORIES OF LITERATURE.

Intensive study of theories of literature pertinent to contemporary criticism and scholarship. *Credit, 3.* Mrs. Lawall.

890. SEMINAR.

Intensive, advanced study of a topic in Comparative Literature. *Credit, 3-6.* Mr. Anderson, Mrs. Pulc.

900. DOCTORAL DISSERTATION.

COURSES OPEN TO BOTH
GRADUATE AND UNDER-
GRADUATE STUDENTS.

621. RENAISSANCE PERSPECTIVES.

The tradition of the Middle Ages, the heritage of the Renaissance—the rhetoric of writing and the arts of reading and interpretation as they were handed down to the Renaissance. Examples and texts from English, French, Italian, and Latin; may be read in translation. *Credit, 3.* Mr. Levine.

622. THE SHAPE OF THE
RENAISSANCE.

Diversity and changes of literary style in the 15th and 16th Centuries, with emphasis on cultural continuity, and with an examination of critical method. Examples and texts from English, French, Italian, Latin, and Spanish; may be read in translation.

Credit, 3. Mr. Levine.

631. THE ENLIGHTENMENT.

Characteristic themes, ideas and attitudes in 18th Century European Literature. Focus on major representatives of the Age of Reason such as Pope, Swift, and Johnson in England; Montesquieu, Voltaire, and Diderot in France; Wieland and Lessing in Germany.

Credit, 3. Mr. Page.

641. ROMANTICISM.

The Western Romantic Movement as exemplified by its principal figures from the age of Rousseau to 1850.

Credit, 3. Mr. Page.

642. FROM IDEALISM TO
REALISM.

Main currents in the post-romantic literature of the Nineteenth Century as expressed by such figures as Heine, Flaubert, and Hardy.

Credit, 3. Mrs. Pulc.

651. SYMBOLISM.

The development of symbolism in the 19th and 20th Century poetry of France (Baudelaire, Verlaine, Mallarmé, Rimbaud), Germany (George, Hofmannsthal, Rilke), and England (Yeats, Pound, Eliot).

Credit, 3. Mr. Mankin.

652. MODERN DRAMA.

Currents in Western drama since Ibsen:

naturalism, symbolism, neo-romanticism, expressionism, folk drama and fantasy, epic realism, the "grotesque" and "absurd" theatre.

Credit, 3. Mr. Mankin, Mr. Moebius.

661. THE CONTEMPORARY
EUROPEAN NOVEL.

Ideological commitments and innovations in the novels of Proust, Gide, Camus; Mann, Hesse, and Kafka; the Bloomsbury Group.

Credit, 3. Mr. Mankin,
Miss Schiffer, Mr. Deaver.

671. EUROPEAN EPIC POETRY.

Literary analysis of major classical and Renaissance epics (by Homer, Virgil, Dante, Milton) and three related heroic poems ("Gilgamesh," "Beowulf," "Chanson de Roland"), with emphasis on their intrinsic qualities as works of art. Primary consideration of specific epic techniques and of the general epic tradition; also with relation to later patterns and themes.

Credit, 3. Mr. Anderson, Mr. J. W. Hunt.

675. ANGLO-GERMAN LITERARY
RELATIONSHIPS.

Subjects and problems common to English and German literature since the middle of the Eighteenth Century with some attention to German-American literary relationships.

Credit, 3. Mr. Page.

Computer Science

GRADUATE FACULTY

Michael A. Arbib, *Chairman of the Program, Professor of Computer Science, and Associate Director of the University Computing Center*, B.Sc., University of Sydney, 1961; Ph.D., Massachusetts Institute of Technology, 1963.

G. Ernest Anderson, *Associate Professor of Education*, B.A., Amherst College, 1950; A.M.T., Harvard University, 1955; Ed.D., 1965.

Frederick H. Edwards, *Associate Professor of Electrical Engineering*, B.A.Sc., University of British Columbia, 1949; M.Sc., Nova Scotia Technical College, 1955.

Roger W. Ehrich, *Assistant Professor of Electrical Engineering*, B.S., University of Rochester, 1965; M.S., Northwestern University, 1967; Ph.D., 1969.

Caxton C. Foster, *Professor of Computer Science*, B.S., Massachusetts Institute of Technology, 1950; M.S., University of Michigan, 1957; Ph.D., 1965.

Robert M. Glorioso, *Assistant Professor of Electrical Engineering*, B.S., Northeastern, 1962; M.S., Connecticut, 1964; Ph.D., 1967.

William L. Kilmer, *Professor of Computer Science*, B.S., Pennsylvania State, 1954; M.S., 1955; Ph.D., University of Michigan, 1958.

Imsong Lee, *Professor of Electrical Engineering*, B.E.E., Rensselaer Polytechnic Institute, 1957; M.E.E., Polytechnic Institute of Brooklyn, 1959; Ph.D., Stanford, 1962.

John A. N. Lee, *Professor of Computer Science*, B.Sc., University of Nottingham, 1955; Ph.D., 1958.

E. M. Riseman, *Assistant Professor of Computer Science*, B.S., Clarkson College of Technology, 1964; M.S., Cornell University, 1966; Ph.D., 1969.

Sue N. Stidham, *Assistant Professor of Computer Science*, A.B., Smith College, 1959; Ph.D., University of Massachusetts, 1964.

Frederick D. Stockton, *Associate Professor of Civil Engineering*, B.S., Alabama, 1942; M.S., Brown, 1949; Ph.D., 1953.

Conrad A. Wogrin, *Professor of Computer Science and Director of the University Computing Center*, B.Eng., Yale, 1949; M.Eng., 1951; D. Eng. 1955.

The following information reflects the structure of the department prior to September, 1971. Beginning in 1971-72, the department will offer additional advanced work in the fields of computer science, theory of computation, and cybernetics. Students are invited to write to Dr. Conrad A. Wogrin, Director of Graduate Admissions, Department of Computer Science, for progress reports on proposed changes.

To be admitted to full graduate status

in this field, candidates must be holders of B.S. or B.A. degrees with good academic records and recommendations having either a minor in computer science or exhibiting a knowledge of computer programming, mathematics through calculus and elementary statistics or equivalent.

Candidates must complete 32 graduate credits of which no more than six may be transferred from another institution. Of this total, at least six must be in the 700 series courses and six in a thesis.

Candidates will be individually advised by members of the interdepartmental committee.

Graduates will be prepared for computer applications work by a program which, while offering computer science courses in the fields of numerical analysis, statistics, logic and mechanical languages, will also require the student to advance his knowledge of his own major or relevant subject. Candidates for the Master of Science in Computer Science will devote six credits to a thesis, at least 12 credits to Computer Science courses and not more than 12 credits to electives in fields such as engineering, statistics or logic. A one-credit seminar in computer science is required in each semester prior to engaging in research towards a thesis.

COMPUTER SCIENCE

First Semester

409. Tools of Research	Credit, 0.
511. Syntactic Analysis.	Credit, 3.
523. Machine and Assembly Language.	Credit, 3.
535. Comparative Machine Design.	Credit, 3.
551. Calculus of Finite Differences.	Credit, 3 or 1.
570. Fundamentals of Computation Theory.	Credit, 3.
585. Cybernetics and the Brain.	Credit, 3.
700. Special Problems.	Credit, 3 or 1.
777. Systems Design I.	Credit, 3.
790. Seminar.	Credit, 2.

Second Semester

409. Tools of Research. *Credit, 0.*
510. Mechanical Languages. *Credit, 3.*
550. Computational Modeling. *Credit, 3.*
552. Topics in Numerical Methods. *Credit, 3 or 1.*
700. Special Problems. *Credit, 3 or 1.*
712. Theory of Programming. *Credit, 3.*
740. Automata. *Credit, 3.*
778. Systems Design II. *Credit, 3.*
787. Information Retrieval and Correlation. *Credit, 3.*
790. Seminar. *Credit, 2.*

COURSES OPEN TO GRADUATE STUDENTS ONLY

700. SPECIAL PROBLEMS (Topic by arrangement each semester).
Recent advances and current problems in a specialized field of computer science.
Prerequisite, permission of instructor.
Credit, 3 or 1.

712. THEORY OF PROGRAMMING.

Theoretical concepts of computer programming to formal languages, syntax specifications, and compilation. Mechanical devices and algebra.
Prerequisite, Comp Sci 511. *Credit, 3.*

740. AUTOMATA.

Introduction to the computerized aspects of artificial intelligence and automata theory.
Prerequisite, Comp Sci 570. *Credit, 3.*

777. SYSTEMS DESIGN I.

Systems analysis, feasibility studies, and applicable techniques of operations research.
Prerequisite, Comp Sci 523. *Credit, 3.*

778. SYSTEMS DESIGN II.

Input/output file control systems: remote terminal devices, management information

systems and other on-line applications, case studies, design and use of extended machine language function facilities for systems programming.

Prerequisite, Comp Sci 777. *Credit, 3.*

787. INFORMATION RETRIEVAL AND CORRELATION.

Methods and systems for information retrieval and correlation presented so as to relate the defining of purposes and requirements with the specifying of operations performed by machine and by people. Particular principles and mathematical formulation. *Credit, 3.*

790. SEMINAR.

Conferences, reports and lectures on topics not currently covered in regular courses.
Prerequisite, permission of instructor.

Credit, 2.

800. MASTER'S THESIS.

Credit, 6.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

510. MECHANICAL LANGUAGES.

The technique of language definitions, translation with particular reference to symbolic assemblers and algebraic compilers.
Prerequisite, Comp Sci 523. *Credit, 3.*

511. SYNTACTICAL ANALYSIS.

Introduction to the concepts and techniques of syntactical analysis with respect to context free grammars, the recognitive processes involved in the analysis and generative algorithms of computer translators. Special consideration to precedence grammars and semantical implications of grammars.
Prerequisite, permission of instructor.

Credit, 3.

523. MACHINE AND ASSEMBLY LANGUAGE.

A description with substantial examples and exercises of the structure of a large scale computer; its operating systems and language leading to studies of assembly and macro language capabilities. *Credit, 3.*

535. COMPARATIVE MACHINE
DESIGN.

The various design concepts of computers. Particular reference to the historical influence of certain computer designers.

Prerequisite, Comp Sci 523. *Credit, 3.*

550. COMPUTATIONAL MODELING.

Introduction to probabilistic techniques as Markov process, Random Walk and Monte Carlo techniques. Statistical techniques, distributions, curve fitting by least squares, correlation coefficients, the method of Chi-square and variances. Selected operations research models such as simple queues, sequencing and a-person zero sum games. Selected topics generated by class interest from various areas of application. *Credit, 3.*

551. CALCULUS OF FINITE
DIFFERENCES.

Introduction to difference tables and finite differences leading to the procedures of interpolation and extrapolation theory, tablet techniques, and the solution of differential equations.

Prerequisites, Comp Sci 121, 131, or equivalent, and Calculus (OR prior credit for Math 551). *Credit, 3 (1).*

552. TOPICS IN NUMERICAL
METHODS.

Computer-oriented numerical analysis, including linear algebra, solution of simultaneous equations, homogenous equations, eigenvectors, solution of differential equations, solution of algebraic and transcendental equations, and functional representations. Prerequisite, Comp Sci 121, 131 or equivalent. *Credit, 3.*

570. FUNDAMENTALS OF
COMPUTATION THEORY.

An introduction to basic concepts of automata, coding and switching theory with special emphasis on the underlying algebraic concepts of sets, relations, graphs, semi-groups, groups, rings, fields, lattices and trees. *Credit, 3*

585. CYBERNETICS AND THE BRAIN.

Information processing in the brain; parallel processing in hierarchically structured systems; perception, memory, and control of movement; layered somatotopically struc-

tured neural nets and their embryological development; feedback and pattern recognition. *Credit, 3.*

Economics

GRADUATE FACULTY

James K. Kindahl, *Head of the Department of Economics and Professor of Economics*, A.B., Chicago, 1951; M.B.A., 1953; Ph.D., 1958.

Norman D. Aitken, *Assistant Professor of Economics*, B.A., University of Cincinnati, 1961; Ph.D., University of Tennessee, 1967.

Solomon Barkin, *Professor of Economics*, B.S., College of the City of New York, 1928; M.A., Columbia University, 1929.

John L. Blackman, Jr., *Associate Professor of Economics*, B.A., Haverford College, 1930; A.M., 1948; Ph.D., Harvard, 1957.

Bradley T. Gale, *Assistant Professor of Economics*, B.S., Worcester Polytechnic Institute, 1964; M.A., Massachusetts, 1965; Ph.D., Rutgers, 1966.

Philip L. Gamble, *Professor of Economics*, B.S., Wesleyan, 1928; M.A., 1929; Ph.D., Cornell, 1935.

Gerald A. Gunderson, *Assistant Professor of Economics*, B.A., University of Washington, 1962; M.A., University of Washington, 1965; Ph.D., University of Washington, 1967.

Vaclav Holesovsky, *Associate Professor of Economics*, Diploma in Political Sciences, University of Paris, 1950; M.A., 1958; Ph.D., Columbia University, 1964.

Marshall C. Howard, *Professor of Economics*, A.B., Princeton, 1941; Ph.D., Cornell, 1951.

Thomas M. Love, *Assistant Professor of Economics*, B.S., Wisconsin State University, 1962; M.S., University of Wisconsin, 1966; Ph.D., 1968.

Bruce R. Morris, *Professor of Economics*, A.B., Western Reserve University, 1931; M.A., Ohio State, 1932; Ph.D., University of Illinois, 1937.

Cadwell L. Ray, *Assistant Professor of Economics*, B.A., Texas A & M, 1959; M.A., 1961; Ph.D., University of Texas, 1967.

Ben B. Seligman, *Professor of Economics*, A.B., Brooklyn College, 1934.

Vernon L. Smith, *Professor of Economics*, B.S., California Institute of Technology, 1949; M.A., Kansas, 1951; Ph.D., Harvard, 1955.

Hugo Sonnenschein, *Professor of Economics*, A.B., Rochester, 1961; M.S., Purdue, 1963; Ph.D., 1964.

George I. Treyz, *Assistant Professor of Economics*, A.B., Princeton University, 1958; Ph.D., Cornell University, 1967.

Arthur W. Wright, *Assistant Professor of Economics*, B.A., Haverford College, 1960; Ph.D., Massachusetts Institute of Technology, 1969.

ASSOCIATED FIVE-COLLEGE GRADUATE FACULTY

George F. Mair, *Professor of Economics*, (Smith College), B.A., Princeton, 1943; M.A., 1948; Ph.D., 1957.

UNIVERSITY OF MASSACHU- SETTS/BOSTON GRADUATE FACULTY

Harold Wolozin, *Professor of Economics*, B.S., Tufts, 1942; Ph.D. Columbia, 1955.

FIELDS OF STUDY

Programs of graduate study in economics are offered in the following fields of specialization: Economic Theory; Quantitative Methods and Econometrics; Monetary Theory and Policy; Public Finance; Economic History; Economic Development; Industrial Organization and Regulation; Labor Economics; International Economics; Comparative Economic Systems.

DEPARTMENT ENTRANCE REQUIREMENTS

In addition to the general requirements for admission to graduate study, candidates for admission in Economics are expected to have had at least five courses (15 credits) in economics, including in-

termediate micro and macro theory. In addition, they should have appropriate backgrounds in Mathematics and Statistics equivalent to at least one semester each of calculus and introductory statistics for M.A. candidates and calculus, linear algebra, and statistics for admission to the Ph.D. program. Deficiencies in entrance requirements may be waived as a condition for admission, but they must be removed either by special examination or by appropriate course work during the first year following admission. Courses taken to remove deficiencies will not be counted towards a degree. Potential candidates are cautioned that entrance without prior work in calculus may seriously disadvantage them in their first-year required theory courses.

The Department also requires submission of Graduate Record Examination scores in Economics, as well as the verbal and mathematical examinations. Students with recognized deficiencies in their economics background are excused from taking the examination in economics. This requirement may also be waived for foreign students. Foreign students whose native language is not English are referred to general Graduate School regulations regarding demonstration of English proficiency prior to beginning course work.

DEGREE REQUIREMENTS

For qualified entering students, the M.A. degree may be obtained in one calendar year of full-time study. The basic requirement is 30 graduate credits, of which at least 12 must be earned in 700-900 series courses. Among these 30 credits, courses are required in Microeconomic Theory (Economics 701), Macroeconomic Theory (Economics 705), or Economics 552, and Mathematical Methods in Economics (Economics 551). In addition, Statistics 551 (Elementary Statistics II) or the equivalent proficiency level is required. An optional M.A. thesis may be submitted in fulfillment of between six and nine of the 30 required credits.

After the completion of the required credits, each M.A. candidate must take comprehensive examinations in theory

and one primary field of specialization. These examinations are offered each year in January, May, and September.

Candidates for the Ph.D. degree are expected to fulfill the following minimum course requirements in economic theory, history and method: Microeconomic Theory (Economics 701 and 702); Macroeconomic Theory (Economics 705 and 706); Economic History (Economics 561 or 562); Mathematical Methods (Economics 551); Econometrics (Economics 752 and 753); and History of Economic Thought (Economics 606).

Candidates for the Ph.D. degree are evaluated at the end of their first year of study, to ascertain whether they should be permitted to continue in the program. All information relevant to the assessment of the student's possible success in the Ph.D. program is scrutinized by members of the Graduate Committee in consultation with the Graduate Faculty. The evaluation may, at the request of either the student or a member of the Graduate Faculty, include an interview with a panel of three or more faculty members selected by the Graduate Committee. At the interview, the student is examined on his understanding of economics; the student may, in addition, present other evidence which he feels supports a recommendation to be permitted to continue in the program.

The Department requires doctoral candidates in Economics to demonstrate proficiency in one foreign language (to be selected from a list approved by the Graduate Economics Faculty) equivalent to the intermediate reading level normally attained in a two-year college language course. Students whose native language is other than English, and in which there is a substantial volume of economics literature, may offer English to satisfy their language requirement.

Upon completion of all requirements except those connected with the thesis, each student will take a comprehensive examination in four fields of specialization, one of which must be economic theory, and one of which will be his major

field on which he will be examined more intensively and held responsible for a higher level of competence.

If a student fails any comprehensive examination he may be permitted a second opportunity after at least six months have elapsed. Additional work including courses may be required as a condition for re-examination.

Each student will present to his committee a dissertation proposal as outlined in this Bulletin. Only after his dissertation proposal has been approved by the committee, and the comprehensive examination has been passed, will he be allowed to register for his dissertation credits in Economics 900 (Dissertation, Ph.D. Degree). Approval for any significant departure from this proposal during the course of the dissertation program will be obtained from the entire committee.

When the dissertation is completed and approved by all the members of the candidate's committee, the committee chairman will arrange the final examination.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL STUDIES IN ECONOMICS.

Credit, 2-9 each semester. Staff.

701, 702. MICROECONOMIC THEORY.

A systematic development of the theory of the consumer, the firm, the industry, and their interactions.

Prerequisite, Econ 201.

Credit, 3 each semester.

705, 706. MACROECONOMIC THEORY.

Nature, construction and use of social accounting systems. A systematic development of static and dynamic theories of aggregative economic behavior and their applications.

Prerequisites, Econ 212 or 214 or equivalent.

Credit, 3 each semester. Mr. Hinckley.

711, 712. MONETARY THEORY.

Contemporary monetary theory and its re-

lation to the achievement of macroeconomic policy goals.

Prerequisite, Econ 705.

Credit, 3. Mr. Gamble, Mr. Hinckley.

721. INTERNATIONAL FINANCE.

An analysis of the properties of foreign exchange markets, adjustment mechanisms, speculation, capital flows and transfer problems, the relationship between balance of payments correctives and domestic policy goals, the balance of payments as a policy problem, and the problem of international liquidity.

Prerequisite, Econ 214 or permission of instructor.

Credit, 3. Mr. Aitken.

722. INTERNATIONAL TRADE THEORY.

The pure theory of international trade. The reasons for trade, the gains from trade, factor price equalization, commercial policy, trade and economic development and customs unions.

Prerequisite, Econ 222 or 522 or permission of instructor.

Credit, 3. Mr. Aitken.

731. INDUSTRIAL ORGANIZATION.

A survey of the literature on the market structure, conduct, and performance of industry.

Prerequisites, Econ 201 or 501 or permission of instructor.

Credit, 3. Mr. Howard, Mr. Gale.

732. INDUSTRIAL REGULATION.

A survey of the literature on controls extended by government over the business sector of the economy.

Prerequisites, Econ 201 or 501 or permission of instructor.

Credit, 3. Mr. Howard, Mr. Gale.

741. COLLECTIVE BARGAINING.

The legal background of collective bargaining, the process, subject matter, and problems involved. Individual case problems.

Prerequisites, Econ 241 or 541.

Credit, 3. Mr. Blackman.

742. LABOR THEORY AND IDEOLOGY.

Evolution of theories explaining the nature of the labor movement. European antecedents and the impact of European ideology.

Relevant social and economic thought in America.

Prerequisites, Econ 241 or 541.

Credit, 3. Mr. Seligman.

743. WAGE THEORY AND WAGE RELATIONSHIPS.

Theoretical and institutional study of theories of wages and wage structure.

Prerequisites, Econ 241 or 541.

Credit, 3. Mr. Blackman.

744. LABOR STATISTICS.

A critical analysis of the methodology, techniques of data gathering, and interpretation and use of current statistical series employed in manpower analysis: employment and unemployment, prices, wages, productivity, and related areas.

Prerequisites, statistics and Econ 241 or 541.

Credit, 3. Mr. Seligman.

745. LABOR DISPUTE SETTLEMENT.

Ways of settling labor disputes, including grievance proceedings, arbitrations, and presidential intervention.

Prerequisites, Econ 241 or 541.

Credit, 3. Mr. Blackman.

746. COMPARATIVE LABOR MOVEMENTS.

Labor movements in various countries with an analysis of their similarities and differences.

Prerequisites, Econ 241 or 541, and History 336.

Credit, 3. Mr. Barkin, Mr. Love.

747. MANPOWER DEVELOPMENT.

A critical examination of current manpower policies and problems. The quantity and quality of manpower resources, problems of labor employment and mobility. Adjustment policies and research tools are reviewed.

Prerequisite, Econ 241 or 541.

Credit, 3. Mr. Barkin.

751. MATHEMATICAL ECONOMICS AND ECONOMIC MODEL-BUILDING.

The various modern applications of mathematics to economic analysis. Both static and dynamic processes will be examined. Given as required.

Prerequisites. Econ 301, 251, or equivalent, one year of college mathematics, and permission of instructor.

Credit, 3.

752, 753. **ECONOMETRICS.**

The application of modern statistical methods to micro and macro economic theory formulated in mathematical terms.

Prerequisites, Econ 251 or permission of instructor.

Credit, 3 each semester. Mr. Kindahl.

761, 762. **GENERAL ECONOMIC HISTORY.**

Topics in the history of economic activity in the western world.

Prerequisite, Econ 261. *Credit, 3.*

765. **ECONOMIC DEVELOPMENT: STRUCTURAL PROBLEMS.**

The concept of economic development and the structural changes needed in underdeveloped countries to permit development.

Prerequisite, 15 hours of economics.

Credit, 3. Mr. Morris.

766. **ECONOMIC DEVELOPMENT: POLICY ISSUES.**

Policy decisions involved in efforts of underdeveloped countries to induce development.

Prerequisite, Econ 765.

Credit, 3. Mr. Morris.

768. **PLANNING ECONOMIC DEVELOPMENT.**

The problems and techniques of inducing development in underdeveloped countries. Case studies of individual countries.

Prerequisite, Econ 266.

Credit, 3. Mr. Morris.

773. **THEORIES OF ECONOMIC SYSTEMS.**

The theory of alternative economic systems, of national economic planning, and of resource allocation under different systems.

Prerequisite, Econ 272.

Credit, 3. Mr. Holesovsky.

774. **SELECTED TOPICS IN SOVIET AND EAST EUROPEAN ECONOMIES.**

Application of advanced economic theory to selected major problems of planned economies of the Soviet type.

Prerequisites, Econ 272, 773.

Credit, 3. Mr. Holesovsky.

801. **HISTORY OF ECONOMIC THOUGHT.**

Treatment in depth of various topics within the history of economic thought.

Prerequisite, Econ 306 or permission of instructor. *Credit, 3.*

803, 804. **SEMINAR IN ECONOMIC THEORY.**

Development of models of economic processes, with emphasis on analysis in depth. Specific subject matter may vary from year to year.

Prerequisite, Econ 701, 702.

Credit, 3. Mr. Smith.

811. **TAXATION.**

Economics of taxation, with detailed examination of the United States revenue structure.

Prerequisite, Econ 312 or 612 or permission of instructor. *Credit, 3.*

812. **PROBLEMS OF TAX REFORM.**

In-depth review of major areas of tax policy and structural reform, including fiscal flexibility, the tax legislative process, depreciation, investment incentives, depletion, capital gains, intergovernmental and international aspects of tax policy.

Prerequisite, Econ 312 or 612 or permission of instructor. *Credit, 3.*

813. **PUBLIC FINANCE.**

Governmental budgeting, expenditure theory, economics of collective consumption, and cost-benefit analysis.

Prerequisite, Econ 312 or 612 or permission of instructor. *Credit, 3.*

814. **FISCAL POLICY.**

Functional finance, taxation and expenditure policies for stabilization and growth, debt management, and coordination of fiscal, monetary and incomes policies.

Prerequisite, Econ 312 or 612 or permission of instructor. *Credit, 3.*

900. **DOCTORAL DISSERTATION.**

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

Prerequisite, Econ 125, to all courses listed below.

511. **MONEY, BANKING AND CREDIT.**

The development and operation of the

monetary and banking systems of the United States; problems of achieving full employment and price stability through monetary controls. *Credit*, 3. Mr. Hinckley.

512. MONEY, INCOME AND MONETARY POLICY.

The relationships among money, income and monetary policy. An examination of the relationships among individuals, banks, money markets, governments and central banks.

Prerequisites, Econ 211 or permission of instructor. *Credit*, 3. Mr. Hinckley.

521. THE INTERNATIONAL ECONOMY.

An historical and analytical introduction to the study of international economic institutions, trade, finance, and policy.

Credit, 3. Mr. Aitken.

522. INTERNATIONAL TRADE AND ECONOMIC POLICY.

Intermediate theory of international trade, including the analysis of the balance of payments mechanism, pure non-monetary theory and its application to the problems of commercial policy.

Prerequisites, Econ 521 or permission of instructor. *Credit*, 3. Mr. Aitken.

531. SOCIAL CONTROL OF BUSINESS.

The formal and informal methods and efforts to maintain, supplement and moderate competition, and the substitution of regulation or public enterprises for competition.

Credit, 3. Mr. Howard, Mr. Gale.

532. THE STRUCTURE OF AMERICAN INDUSTRY.

Business enterprise, market competition, and economic development in American industries. The social effectiveness of industries analyzed through measures of industrial structure and market performance.

Credit, 3. Mr. Gale.

541. LABOR PROBLEMS.

Background of the labor movement and problems involved in the management-labor relationship and the efforts of management, unions and government to solve them.

Credit, 3. Mr. Blackman, Mr. Love.

542. LABOR LAW AND LEGISLATION.

Economic effect and historical survey of Federal and state laws and an analysis of important court decisions.

Prerequisite, Econ 241 or permission of instructor.

Credit, 3. Mr. Blackman, Mr. Love.

551. MATHEMATICAL METHODS IN ECONOMICS.

The application of various mathematical concepts and techniques of macro-economic and micro-economic analysis. Special emphasis is placed on the design and interpretation of mathematical models of economical phenomena.

Prerequisite, one year of college mathematics, or permission of instructor.

Credit, 3.

552. ECONOMETRICS.

The application of mathematical and statistical methods to economic theory. Emphasis on application to both micro- and macro-economics policy issues.

Prerequisites, one semester of calculus and one semester of statistics, or permission of instructor.

Credit, 3.

554. THE MEASUREMENT OF ECONOMIC ACTIVITY.

A description and analysis of the major types and sources of economic data used in empirical research pertaining to the national economy and its parts.

Prerequisite, Econ 126 or permission of instructor.

Credit, 3.

561. EUROPEAN ECONOMIC EVOLUTION.

Analysis of the development of market institutions with reference to the determinants of economic growth in Europe since the late Middle Ages.

Credit, 3.

562. AMERICAN ECONOMIC HISTORY.

An analytical approach to structural change, economic growth and the development of market institutions in the United States from colonial times to the present.

Credit, 3. Mr. Gunderson.

566. ECONOMIC DEVELOPMENT.

Economic problems of underdeveloped countries and the policies necessary to induce growth. Individual projects will be required. *Credit, 3. Mr. Morris.*

567. LATIN AMERICAN
ECONOMIC DEVELOPMENT.

Development of the Latin American economies, with emphasis on the central problems of the various economies and proposed economic programs.

Prerequisite, Econ 266 or permission of instructor. *Credit, 3.*

571. COMPARATIVE ECONOMIC
SYSTEMS.

Evaluation of the performance of alternative economic systems in theory and practice. Problems of planning in the advanced economies of the U.S., Western Europe, and Soviet area. *Credit, 3. Mr. Holesovsky.*

572. THE SOVIET ECONOMY.

Resource allocation through centralized planning in the Soviet economic system. A case history of economic development. Current problems of economic reform.

Credit, 3. Mr. Holesovsky.

581. REGIONAL ECONOMICS.

The process of regional economic growth; location theory and basic techniques of regional analysis; public and private area development programs. *Credit, 3.*

582. URBAN ECONOMICS.

Structure of the urban economy; goals, processes, problems and policy in urban economic development. *Credit, 3.*

601. DECISION THEORY
IN ECONOMICS.

Modern theory of rational decision-making under conditions of uncertainty, risk, and conflict. Applications to the theory of the firm and the theory of oligopoly.

Prerequisites, Econ 126 and one year of college mathematics, or permission of instructor. *Credit, 3.*

604. FINANCIAL ASPECTS
OF ECONOMICS.

Application of modern flow-of-funds analysis to the financial behavior of the various

sectors of the economy. Special emphasis is placed on the financial aspects of business units and the business sector.

Prerequisite, Accounting 125 or permission of instructor. *Credit, 3.*

606. DEVELOPMENT OF
ECONOMIC THOUGHT

Development of economic analysis since 1500. Main currents in the evolution of mercantilistic, Physiocratic, classical, neo-classical, Marxian and Keynesian economic thought. *Credit, 3.*

612. PUBLIC FINANCE.

Principles of public revenues and expenditures; systems and problems of taxation; use of taxes, expenditures, debt policy to provide full employment, economic growth, and price stability. *Credit, 3. Mr. Ray.*

614. STATE AND LOCAL
FINANCE.

Analysis of state and local government revenue sources, expenditures, and fiscal systems. Problems of intergovernmental fiscal relations.

Prerequisite, Econ 125. *Credit, 3. Mr. Ray.*

641. ECONOMIC SECURITY.

Public and private programs to prevent or alleviate economic insecurity, including poverty, substandard incomes, and economic contingencies.

Credit, 3. Mr. Blackman, Mr. Love.

662. TECHNOLOGY IN
WESTERN CIVILIZATION.

Origins and impact of the industrial revolution, technological changes on work and society. Social and economic effects of automation. *Credit, 3. Mr. Gunderson.*

691, 692. SEMINAR.

Credit, 1-3 each semester. Staff.

COURSES NOT FOR
MAJOR CREDIT

501. INTERMEDIATE ECONOMIC
THEORY.

Microeconomic analysis of consumers, firms, industries, and markets; rational decision-making under conditions of certainty; balancing forces in a free-enterprise economy. *Credit, 3. Mr. Gordon.*

514. MACROECONOMIC THEORY
AND BUSINESS CYCLES.

Formulation and empirical testing of static and dynamic theories of aggregative income, employment, and prices, with special reference to the business cycle, growth, and economic forecasting. *Credit*, 3. Mr. Treyz.

Education

GRADUATE FACULTY

Dwight W. Allen, *Dean of the School of Education and Professor of Education*, A.B., Stanford, 1953; M.A., 1957; Ed.D., 1959.

G. Ernest Anderson, Jr., *Associate Professor of Education*, B.A., Amherst, 1950; A.M.T., Harvard, 1955; Ed.D., 1966.

Albert S. Anthony, *Professor of Education*, B.S., Trinity, 1937; M.A.T., Harvard, 1941; Ed.D., 1955.

Ray Budde, *Assistant Professor of Education*, B.S., St. Louis University, 1943; M.Ed., Illinois, 1947; Ed.D., Michigan State, 1958.

Emma Cappelluzzo, *Associate Professor of Education*, B.S., Boston University, 1955; M.Ed., Arizona, 1959; D.Ed., 1965.

Richard J. Clark, Jr., *Assistant Professor of Education*, B.A., Amherst College, 1960; M.Ed., Harvard, 1961; Ed.D., Stanford, 1969.

James M. Cooper, *Assistant Professor of Education*, A.B., Stanford, 1962; A.M., 1962; Ph.D., 1967.

David E. Day, *Associate Professor of Education*, B.S., State University of New York at Brockport, 1952; M.S., 1958; Ed.D., Wayne State, 1962.

Philip L. Edgecomb, *Assistant Professor of Education*, B.S., Maine, 1955; M.Ed., Pennsylvania State, 1960; Ph.D., 1961.

David R. Evans, *Assistant Professor of Education*, B.S., Oberlin, 1959; M.S., Illinois, 1961; Ph.D., Stanford, 1969.

Arthur W. Eve, *Associate Professor of Education*, B.Ed., Chicago Teachers College, 1957; M.A., University of Chicago, 1961; Ph.D., 1967.

William V. Fanslow, *Assistant Professor of Education*, A.B., Chapman College, 1959; M.A., Stanford, 1961; Ph.D., 1967.

Louis Fischer, *Professor of Education*, B.A., Stanford, 1949; LL.B., 1951; M.A., 1954; Ph.D., 1958.

David Flight, *Assistant Professor of Education*, B.A., University of Pennsylvania, 1950; M.A., Columbia, 1956; Ph.D., University of Chicago, 1969.

Douglas R. Forsyth, *Assistant Professor of Education*, B.A., Bucknell, 1960; M.A., 1962; Ph.D., Colorado State, 1968.

Jimmie C. Fortune, *Associate Professor of Education*, B.A., Southwestern at Memphis, 1956; M.A., Memphis State, 1960; Ed.D., Stanford, 1965.

Ronald H. Fredrickson, *Associate Professor of Education*, B.S., Kansas State Teachers, 1953; M.S., 1959; Ph.D., 1963.

William E. Griffiths, *Associate Professor of Education*, A.B., Pennsylvania State, 1949; M.Ed., 1950; Ed.D., University of Pennsylvania, 1963.

Richard F. Haase, *Assistant Professor of Education*, B.S., Occidental, 1963; M.S., California State at Los Angeles, 1965; Ph.D., Colorado State, 1968.

Donald E. Hall, *Assistant Professor of Education*, B.S., Gorham Teachers, 1954; Ed.M., 1955; Boston University, Ed.D., 1965.

Ronald K. Hambleton, *Assistant Professor of Education*, B.A., University of Waterloo, 1966; M.A., University of Toronto, 1967; Ph.D., 1969.

Thomas E. Hutchinson, *Assistant Professor of Education*, A.B., Rutgers, 1959; Ed.M., Boston University, 1961; Ed.D., Harvard, 1969.

Allen E. Ivey, *Professor of Education*, A.B., Stanford, 1955; Ed.D., Harvard, 1959.

Byrd L. Jones, *Associate Professor of Education*, B.A., Williams College, 1960; Ph.D., Yale, 1966.

Robert C. Jones, *Assistant Professor of Education*, B.S., Maine, 1937; M.S., Massachusetts, 1953; Ed.D., Cornell, 1960.

Daniel C. Jordan, *Professor of Education*, B. Mus., Wyoming, 1954; B.A., Oxford, 1959; M.A., Chicago, 1960; Ph.D., 1964.

Richard D. Konicek, *Assistant Professor of Education*, B.S., Illinois, 1963; M.S., 1954; Ed.D., Columbia, 1967.

William G. Kornegay, *Professor of Education*, B.A., North Carolina, 1949; M.Ed., 1957; Ph.D., 1959.

William Lauroesch, *Associate Professor of Education*, A.B., Colgate University, 1942; M.A., Syracuse, 1947; Ed.D., New York University, 1956.

Helen Frances O'Leary, *Associate Professor of Education*, B.S., in Ed., Boston University, 1934; Ed.M., 1941; Ph.D., Connecticut, 1960.

David M. Schimmel, *Associate Professor of Education*, B.A., Duke, 1955; LL.B., Yale University Law School, 1958; B.H.L., Hebrew Union College, 1967.

Earl Seidman, *Assistant Dean and Assistant Professor of Education*, B.A., Oberlin, 1959; A.M.T., Harvard, 1960; Ph.D., Stanford, 1967.

Sidney B. Simon, *Professor of Education*, B.A., Pennsylvania State University, 1949; M.Ed., 1952; Ed.D., New York University, 1958.

Robert L. Sinclair, *Assistant Professor of Education*, B.S., Miami University, 1960; M.E., 1961; Ed.D., University of California at Los Angeles, 1968.

Leverne J. Thelen, *Associate Professor of Education*, B.S., Nebraska State Teachers College at Wayne, 1949; M.A., Nebraska, 1956; Ed.D., 1961.

Richard O. Ulin, *Professor of Education*, A.B., Harvard, 1938; M.A., 1942; Ed.M., 1949; Ed.D., 1958.

George E. Urch, *Assistant Professor of Education*, B.A., Western Michigan, 1953; M.A., 1959; Ph.D., University of Michigan, 1967.

Peter H. Wagschal, *Assistant Professor of Education*, B.A., Harvard, 1966; M.A., Stanford, 1967; Ed.D., University of Massachusetts, 1969.

Gerald Weinstein, *Professor of Education*, B.S., Temple, 1954; M.Ed., 1959.

Robert R. Wellman, *Associate Professor of Education*, A.B., Dartmouth, 1954; M.A., Western Reserve, 1959; Ph.D., Ohio State, 1962.

William C. Wolf, Jr., *Professor of Education*, B.S., State College, Kutzman, Pennsylvania, 1955; Ed.M., Ohio University, 1956; Ph.D., University of Iowa, 1959.

Robert L. Woodbury, *Assistant Dean and Associate Professor of Education*, B.A., Amherst, 1960; M.A., Yale, 1962; Ph.D., 1966.

Raymond Wyman, *Professor of Education*, B.S., Massachusetts, 1937; M.Ed., Boston University, 1947; D.Ed., 1956.

David J. Yarrington, *Assistant Professor of Education*, B.A., Duke, 1960; M.Ed., Cornell, 1961; Ed.D., University of Pennsylvania, 1968.

The School of Education presently offers the Ed.D., M.Ed., and M.A.T. degrees, and the Certificate of Advanced Graduate Study. Also offered is a non-degree teacher certification program. Decision on a Ph.D. program is pending.

DOCTORAL PROGRAMS

Within the framework of University Graduate School regulations, all doctoral programs are based on the following two procedures:

(1) Each student plans his own doctoral program with the advice of and subject to the approval of an advisory committee;

(2) Each student compiles as a supplement to his transcript a portfolio record of the educational experiences which constitute his doctoral program. The portfolio serves as a means for his committee to review his program and as an aid to self-evaluation and self-direction. Students are expected to spend at least two consecutive semesters under direct supervision of their committees, participate in conceptual or quantitative research efforts, engage in teaching or some form of field experience, become familiar with contemporary problems in education, and take a comprehensive ex-

amination prior to writing a dissertation. Typically, a candidate spends at least three years beyond the bachelor's degree in full time study.

MASTER'S PROGRAM

Master's degree programs usually involve at least one year's full-time work beyond the bachelor's degree. In conjunction with other University schools and colleges, the School offers a Master of Arts in Teaching degree for prospective teachers at the elementary, secondary, and higher education levels. MAT programs typically involve a total of 36 credit hours, 12 in the academic disciplines, 12 in professional education, and 12 in combination of the two, with proportionate emphasis depending on the student's background and goals.

The Master of Education degree is offered for prospective elementary teachers, for professional improvement of elementary and secondary teachers, and the training of educational specialists in any of the Areas of Concentration listed below. Each candidate negotiates his 33-credit program with his adviser.

CERTIFICATE OF ADVANCED GRADUATE STUDY

Programs leading to a Certificate of Advanced Graduate Study, individually negotiated with a member of the instructional staff, are designed for those persons who seek advanced work in any of the areas listed below, but who are not committed to the more lengthy and rigorous requirements of a doctoral program. Each candidate negotiates his 30-credit program with his adviser.

TEACHER CERTIFICATION PROGRAM

The non-degree Certification Program provides bachelor's degree holders with an opportunity to do course work and student teaching which satisfy state certification requirements. Such a program ordinarily requires a student-teaching experience and involves one to two semes-

ters' work. Each candidate negotiates his program with his adviser.

AREAS OF CONCENTRATION

Degree candidates will ordinarily do their work within the purview of one of the School's centers or special programs which currently include Centers for: Aesthetics in Education, Human Relations, Educational Research, Humanistic Education, Educational Innovations, International Education, Leadership in Educational Administration, Educational Media and Technology, Foundations of Education, Urban Education, and Teacher Education; and the programs in Early Childhood Education, Compensatory Education, Higher Education, Reading, and Vocational Education. It is possible also for a student and his advisory committee to evolve a graduate program that does not fall specifically under any one center or program. Students interested in more specific aspects of study in any of the above areas should contact the appropriate center or program director. A listing of specific course offerings may be obtained from the School of Education.

Electrical Engineering

GRADUATE FACULTY

G. Dale Sheckels, *Chairman of the Department of Electrical Engineering and Professor of Electrical Engineering*, B.S., University of Washington, 1938; M.S., Massachusetts Institute of Technology, 1940; Ph.D., Iowa State University, 1955.

Michael A. Arbib, *Professor and Head of Computer Science*, B.S., University of Sidney, 1961; Ph.D., Massachusetts Institute of Technology, 1963.

Gilbert W. Bett, *Associate Professor of Electrical Engineering*, B.S. Massachusetts Institute of Technology, 1952; M.S., 1952; E.E., 1958.

Leonard S. Bobrow, *Assistant Professor of Electrical Engineering*, B.S., University of

- Miami, 1962; M.S., Northwestern, 1964; Ph.D., 1968.
- Roger W. Ehrich, *Assistant Professor of Electrical Engineering*, B.S., University of Rochester, 1965; M.S., Northwestern University, 1967; Ph.D., 1969.
- Caxton C. Foster, *Associate Professor of Computer Science*, B.S., Massachusetts Institute of Technology, 1950; M.S., University of Michigan, 1957; Ph.D., 1965.
- Lewis E. Franks, *Associate Professor of Electrical Engineering*, B.S., Oregon State University, 1952; M.S., Stanford, 1953; Ph.D., 1957.
- Robert M. Glorioso, *Assistant Professor of Electrical Engineering*, B.S., Northeastern, 1962; M.S., Connecticut, 1964; Ph.D., 1967.
- Herbert A. Herchenreder, *Assistant Professor of Electrical Engineering*, B.S., University of Missouri, 1951; M.S., Connecticut, 1957.
- Francis S. Hill, Jr., *Assistant Professor of Electrical Engineering*, B.E., Yale, 1962; M.E., 1964; Ph.D., 1968.
- Charles E. Hutchinson, *Professor of Electrical Engineering*, B.S., Illinois Institute of Technology, 1957; M.S., Stanford, 1961; Ph.D., 1963.
- Darrell R. Jackson, *Assistant Professor of Electrical Engineering*, B.S., University of Washington, 1960; M.S., 1963; Ph.D., 1966.
- Joseph W. Langford, *Professor of Electrical Engineering*, B.S., University of New Hampshire, 1929; M.S., Massachusetts Institute of Technology, 1933.
- Imsong Lee, *Professor of Electrical Engineering*, B.E.E., Rensselaer Polytechnic Institute, 1957; M.E.E., Polytechnic Institute of Brooklyn, 1959; Ph.D., Stanford, 1962.
- Robert E. McIntosh, *Assistant Professor of Electrical Engineering*, B.S., Worcester Polytechnic Institute, 1962; M.S., Harvard, 1963; Ph.D., University of Iowa, 1967.
- John W. Mohn, *Associate Professor of Electrical Engineering*, M.E., Stevens Institute of Technology, 1941; B.S., Worcester Polytechnic Institute, 1947; M.S., Stanford, 1952.
- Richard V. Monopoli, *Professor of Electrical Engineering*, B.S., U.S. Naval Academy, 1952; M.S., Brown, 1960; Ph.D., Connecticut, 1965.
- David H. Navon, *Professor of Electrical Engineering*, B.E.E., City College of New York, 1947; M.S., New York University, 1950; Ph.D., Purdue, 1953.
- Edward M. Riseman, *Assistant Professor of Computer Science*, B.S., Clarkson College of Technology, 1964; M.S., Cornell, 1966; Ph.D., 1969.
- Donald E. Scott, *Associate Professor of Electrical Engineering*, B.S., Connecticut, 1957; M.S., 1959; Ph.D., Worcester Polytechnic Institute, 1968.
- Sue N. Stidham, *Assistant Professor of Computer Science*, A.B., Smith College, 1959; Ph.D., University of Massachusetts, 1964.
- Ting-wei Tang, *Associate Professor of Electrical Engineering*, B.S., National Taiwan University, 1957; M.S., Brown, 1961; Ph.D., 1964.
- Ian B. Thomas, *Associate Professor of Electrical Engineering*, B.E., (Elec.), University of Queensland, 1958; B.Sc. (Phys.), 1959; M.S., University of Illinois, 1961; Ph.D., 1966.
- Lester C. Van Atta, *Professor of Electrical Engineering*, B.A., Reed College, 1927; Ph.D., Washington University, 1931.
- Conrad A. Wogrin, *Professor of Computer Science*, B.E., Yale, 1948; M.E., Yale, 1951; D.Engg., Yale, 1955.
- Sigfrid Yngvesson, *Associate Professor of Electrical Engineering*, Teknologie Licentiat, Chalmers Institute of Technology, Sweden, 1964; Teknologie Doktor, 1968.

REQUIREMENTS FOR M.S. DEGREE IN ELECTRICAL ENGINEERING

1. EE 800, Thesis, 6 credits.
2. At least four EE-700-series courses.
3. Additional graduate courses chosen by the student with the approval of his ad-

viser, to constitute a unified program and to satisfy the 30 credit requirement for the M.S. degree. These courses are normally chosen from the fields of engineering, mathematics, physics, and computer science.

4. Supporting courses as required to remove background deficiencies.

5. University-wide requirements as described in the General Information section of this bulletin.

6. The student will be assigned a temporary program adviser by the Departmental Graduate Committee. The student is encouraged to select a major thesis adviser after one semester of study. In consultation with his major thesis adviser, the student will prepare a proposal for thesis research to be submitted for approval by the Departmental Graduate Committee.

A brochure containing detailed information on the requirements for M.S. degree in Electrical Engineering is available from the Departmental Graduate Committee.

REQUIREMENTS FOR PH.D. DEGREE IN ELECTRICAL ENGINEERING

In addition to the residency, dissertation, and examination requirements described in the General Information section of this bulletin, the following departmental requirements must be satisfied.

There is no formal course requirement for the Ph.D. degree. Typical programs include approximately 24 credits of course work beyond the course requirements for the Master's degree.

All doctoral students are required to pass a qualifying examination. This examination is administered every January and all students are encouraged to take this examination in their first year of graduate study.

A written foreign language examination testing reading knowledge sufficient to understand technical journal material normally in French, Russian, or German must be passed by each candidate. This

examination is administered by the Electrical Engineering Department.

A brochure containing detailed information on the Ph.D. degree in Electrical Engineering is available from the Departmental Graduate Committee.

RESEARCH IN ELECTRICAL ENGINEERING

The Electrical Engineering Department is conducting active research and has supporting academic programs in the following areas.

Computer Systems Engineering
Communications and Signal Processing
Systems and Control Theory
Man-Machine Systems
Solid State Devices and Microelectronics
Electrodynamics and Plasma Physics
Ocean Engineering

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS.

Recent advances and current problems in a specialized field of electrical engineering.

Prerequisite, permission of instructor.

Credit, 3. Staff.

705. ANALYSIS OF LINEAR SYSTEMS.

Complex variables; modern systems analysis basic to network synthesis, control systems, and communication systems; including Laplace, Fourier, and z transforms, and convolution.

Prerequisite, EE 221 or equivalent.

Credit, 3. Mr. Bobrow.

706. ELECTROMAGNETIC FIELD THEORY.

Microscopic and macroscopic properties of magnetic and insulating materials; gyromagnetism and the permeability tensor; reflection and refraction; skin effect; antenna analysis; relativistic electrodynamics.

Prerequisite, EE 257 or equivalent.

Credit, 3. Mr. McIntosh.

**707. ADVANCED MICROWAVE
ENGINEERING.**

Analysis of waveguides, gyrators, antennas and other microwave circuit elements; electron ballistics; ionospheric reflection; and refraction, and the permittivity tensor; microwave generators; masers and lasers. Three class hours; one 3-hour laboratory period.

Prerequisites, EE 294 and 706 or equivalent.

Credit, 4. Mr. McIntosh.

**708. INTRODUCTION TO PLASMA
DYNAMICS.**

Fundamentals of plasma physics: motion of a charged particle in electromagnetic fields, magnetoionic theory, the Boltzmann and Vlasov equations for plasmas, and wave propagation through a plasma medium.

Prerequisite, EE 706.

Credit, 3. Mr. McIntosh, Mr. Tang.

709. ADVANCED ANALYSIS.

Matrix analysis. State variables and state space techniques. Concepts of controllability and observability. Stability analysis via Liapunov's and Popov's method, phase plane and describing function.

Requisite, EE 705 concurrently.

Credit, 3. Mr. Hutchinson,
Mr. Monopoli.

711. SIGNAL THEORY I.

Unified treatment of techniques for representation of signals and signal processing operations. Emphasis on physical interpretation of vector spaces, linear operators, transform theory and optimal design of signals.

Credit, 3. Mr. Franks, Mr. Hill.

712. SIGNAL THEORY II.

Signal space methods applied to random processes, giving the modern interpretation of optimum filtering, signal parameter estimation, and signal detection. Many examples of practical applications.

Credit, 3. Mr. Franks, Mr. Hill.

**720. MODERN SOLID-STATE
ENGINEERING.**

Fundamental quantum mechanical principles; a basis for advanced courses in Semiconductor Electronics, Microwave Magnetics, Quantum Electronics, etc. Solutions

of Schrodinger's equation pertinent for electrical engineers.

Prerequisite, M&AE 288 or equivalent.

Credit, 3. Mr. Jackson, Mr. Navon.

**721. MODERN ENGINEERING
MAGNETICS.**

Paramagnetism, paramagnetic resonance, solid-state masers, ferro- and ferrimagnetism, magnetic domains, Ising model, spin waves, ferromagnetic resonance, magneto-elastic coupling, instability phenomena, resonance devices, power limiters, microwave ultrasonics in magnetic materials.

Prerequisite, EE 720.

Credit, 3. Mr. Jackson.

**722. PHYSICAL SEMICONDUCTOR
ELECTRONICS.**

Crystallography of solids, band theory of solids, quantum theory of electrons in a periodic lattice, dynamics of lattice vibrations, semiconductors—equilibrium and transient behavior, modern quantum electronic devices.

Prerequisite, EE 720.

Credit, 3. Mr. Navon.

733. DIGITAL CONTROL SYSTEMS.

Pulse transfer functions and state transition analysis applied to discrete-data systems. Nonconventional sampling. Nonlinear sampled data systems. Dynamic programming and computer control.

Prerequisite, EE 709. *Credit, 3.* Mr. Bett,
Mr. Monopoli, Mr. Hutchinson.

**734. OPTIMUM CONTROL
SYSTEMS.**

Analytical design of optimum linear systems. Calculus of variations, Pontryagin's Maximum Principle and applications to design of optimum systems. Minimum mean square estimation and control.

Prerequisites, EE 601 and EE 709.

Credit, 3. Mr. Hutchinson,
Mr. Monopoli.

735. ADAPTIVE CONTROL.

The problem of system identification, performance criteria and decision making, and the implementation of adaptive techniques. Application of adaptive techniques to aircraft flight control.

Prerequisite, EE 733-4.

Credit, 3. Mr. Hutchinson,
Mr. Monopoli.

736. DYNAMICS AND CONTROL OF MARINE VEHICLES (OE 752).

A development of the equations of motion for a marine vehicle, followed by a study of the stability and dynamics for control.

Credit, 3. Mr. Hutchinson.

741. ENERGY STORAGE AND CONVERSION (OE 721).

Methods of energy generation, conversion, and control, with emphasis on the utilization for deep sea submersible vehicles.

Credit, 3. Mr. Monopoli, Mr. Sheckles.

742. UNDERWATER ACOUSTICS (OE 701).

The principles, effects, and phenomena of underwater sound and its application to practical problems.

Prerequisite, EE 306/606.

Credit, 3. Mr. Hutchinson,
Mr. Thomas, Mr. Russell.

743. NAVIGATION (OE 751).

A survey of the principles of navigation with particular emphasis on the information processing involved and error analysis.

Credit, 3. Mr. Hutchinson.

744. ERROR CORRECTING CODES.

Introduction to linear and modern algebra. Properties, error correcting capabilities, and construction of group codes, both block and convolutional. Matrix and polynomial formulations. Decoding with sequential circuits.

Credit, 3. Mr. Bobrow.

745. INFORMATION THEORY.

Discrete and continuous systems without memory information, mutual information, entropy, redundancy, efficiency, channel capacity, codes and error correction codes, coding and decoding theorems.

Prerequisite, EE 601.

Credit, 3. Mr. Bobrow.

746. STATISTICAL COMMUNICA- TION THEORY.

Review of probability and random process theory; series expansions of random processes, shot noise; the Gaussian process;

optimum smoothing and prediction; random signals through nonlinear devices; introduction to decision theory.

Prerequisite, EE 601.

Credit, 3. Mr. Franks.

747. TRANSISTOR CIRCUITS.

Transistor circuit models and characteristics determined from physical principles. Performance criteria determined with respect to temperature, time, frequency, circuit configuration, extraneous signals, signal amplitude, and waveform.

Prerequisite, EE 233 or equivalent.

Credit, 3. Mr. Langford, Mr. Mohn.

748. NETWORK SYNTHESIS.

Synthesis methods for the realization of passive networks: Brune, Bott-Duffin, Darlington doubly terminated two-ports and others. Positive-real functions, the approximation problem, Chebyshev and Butterworth filters.

Prerequisite, EE 705.

Credit, 3. Mr. Bobrow.

749. SYNTHESIS OF ACTIVE NETWORKS.

A survey of linear active and nonreciprocal circuit elements, their properties and practical realizations; realizability conditions, synthesis methods, negative resistance amplifiers; continuously equivalent networks; use of the digital computer in practical synthesis problems.

Prerequisite, EE 748.

Credit, 3. Mr. Bobrow.

750. GRAPH THEORY AND ITS APPLICATIONS.

Fundamental concepts of graph theory including circuits, cut-sets, paths and duality. Application to network analysis and synthesis, switching theory, variable-length and error-correcting codes, and communication networks.

Credit, 3. Mr. Bobrow.

762. INTRODUCTION TO SPEECH ANALYSIS.

The acoustics of speech production and the engineering analysis techniques employed in speech processing.

Credit, 3. Mr. Thomas.

763. ADVANCED SPEECH
PROCESSING.

Advanced studies of speech processing techniques with emphasis on current literature in speech analysis, transmission, synthesis and recognition by machine,
Prerequisite, EE 762.

Credit, 3. Mr. Thomas.

781. SOLID-STATE CIRCUITS.

Transistor limitations and performance under extremal conditions. Design of multi-stage amplifiers with emphasis on feedback, high-frequency and wide-band applications. Active filters; parametric amplifiers; harmonic oscillators; integrated circuits; and associated topics.

Prerequisite, EE 747.

Credit, 3. Mr. Langford, Mr. Mohn.

785. SELECTED TOPICS IN
CONTROL SYSTEMS.

Topics selected from the current literature. An investigation in depth of problems relating to particular aspects of automatic control theory.

Credit, 1-3. Staff.

786. SELECTED TOPICS IN
COMMUNICATIONS.

Topics for various aspects of present interest in the field of communications with emphasis on concurrent reading of the literature.

Credit, 1-3. Staff.

789. ADVANCED PULSE CIRCUITS.

Analysis and design of pulse-mode electronic circuits and systems, digital circuits, and circuits for waveforming, timing, counting, sweeping and synchronizing.

Prerequisite, EE 588.

Credit, 3. Mr. Herchenreder,
Mr. Langford.

793, 794. SEMINAR IN ELECTRICAL
ENGINEERING.

Presentations of current research activities and literature by faculty and graduate students.

Credit, 1 each semester.

800. MASTER'S THESIS.

An individual theoretical and/or experimental investigation or a design problem terminating with an acceptable thesis. The research proposal is to be approved at least five months before graduation.

Credit, 6.

900. DOCTORAL DISSERTATION.

Credit, 30.

COURSES OPEN TO BOTH GRADUATE
AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

510. DIGITAL CIRCUIT THEORY.

An introduction to the theory of digital circuits stressing general techniques for the analysis and synthesis of combinational and sequential logic systems.

Prerequisite, junior standing. *Credit, 3.*

566. SIGNAL PROCESSING AND
COMMUNICATION SYSTEMS I.

Principles of design of modern communication systems. Mathematical description of digital and analog signals. Basic limitations of modulation techniques and information capacity of transmission systems.

Prerequisite, EE 202, 204. *Credit, 3.*

567. SIGNAL PROCESSING AND
COMMUNICATION SYSTEMS II.

Techniques for evaluating performance of modulation and information transmission systems. Extraction of signals from noise. Minimum error signal estimation and detection.

Prerequisites EE 266, 265 or permission of instructor. *Credit, 3.*

570. SOLID STATE DEVICES.

Review of transistor physics, recombination statistics, avalanche and tunneling phenomena, varactor diodes, Schottky diodes, thyristors, tunnel diodes, junction and MOS field-effect devices, p-n junction lasers.

Prerequisite, EE 201 *Credit, 3.*

571. MICROELECTRONICS.

Principles and applications of microelectronics with particular emphasis on silicon monolithic integrated circuits. Fundamental limitations of microminiaturization, design constraints imposed by the monolithic technique, planar technology, digital and linear microcircuits.

Prerequisite, EE 201. *Credit, 3.*

578. DIGITAL SYSTEMS DESIGN.

The design of a digital system by the interface of subunits described in terms of register sets. The subunits are interfaced at the

architectural level by a set of instructions and at the logic level by the Boolean equations derived from the corresponding register transfers.

Prerequisite, EE 210.

Credit, 3.

587. MARINE INSTRUMENTATION.

A survey of the oceanographic parameters of interest to ocean engineers, followed by the theory of measurement for those parameters. Typical examples of existing measuring equipment.

Credit, 3.

590. FEEDBACK CONTROL SYSTEMS I.

Time domain and frequency domain analysis and synthesis techniques for linear continuous control systems. The relationships between these techniques.

Prerequisites, EE 142 or permission of instructor.

Credit, 3.

591. FEEDBACK CONTROL SYSTEMS II.

The analysis of nonlinear continuous control systems and an introduction to digital control systems and optimization techniques.

Prerequisite, EE 290.

Credit, 3.

594. MICROWAVE ENGINEERING I.

Electromagnetic theory applied to microwave propagation in waveguides and coaxial lines. Microwave circuit theory with applications to passive microwave networks.

Prerequisite, EE 258.

Credit, 3.

595. MICROWAVE ENGINEERING II.

Continuation of EE 594. Modern microwave components including filters, ferrite devices, multiport junctions, amplifiers and oscillators. Generation, radiation and detection of microwaves.

Prerequisite, EE 594.

Credit, 3.

598. BIOMEDICAL ENGINEERING I.

Techniques and concepts from control and communication theory useful in biological, medical and psycho-physical research.

Prerequisite, permission of instructor.

Credit, 3.

599. BIOMEDICAL ENGINEERING II.

Engineering analysis of the visual, position-motion sensing, taste and smell biological

communication channels; human tracking capabilities; analog and hybrid modeling.

Prerequisite, EE 298.

Credit, 3.

606. ACOUSTICS.

The fundamentals of sound generation, propagation and detection. Applications of theory to underwater sound and human speech.

Prerequisite, Junior standing or permission of instructor.

Credit, 3.

611. APPLIED NONLINEAR ANALYSIS.

The analysis of nonlinear mechanical and electrical systems. Numerical, graphical and analytical methods used to determine the behavior of modern nonlinear devices.

Prerequisite, Math 174.

Credit, 3.

642. NON-NUMERICAL PROCESSING.

Introduction to basic mathematical and logical concepts relevant to description and manipulation of information structures such as lists, trees, and graphs in LISP.

Prerequisite, CS 223.

Credit, 3.

644. PROGRAMMING STRUCTURES.

Introduction to basic structures of algorithms and programming languages. Convergence of algorithms. Introduction to logic and programming languages for description and implementation of algorithms.

Prerequisite, CS 223.

Credit, 3.

654. COMPUTER SYSTEMS LABORATORY III.

Project laboratory in advanced computer systems engineering including designs of integrated hardware/software systems and studies of current computer techniques. Nine laboratory hours.

Prerequisite, permission of instructor.

Credit, 3.

656. INTRODUCTION TO AUTOMATA THEORY.

An introduction to formal processes of computation. Computability, automata, algorithms, recursive functions. Formal systems, computing power of machines, and automata as examples of formal systems.

Prerequisite, permission of instructor.

Credit, 3.

660. COMPUTER GRAPHICS.

Basic organization of computer-driven graphical display systems. Methods for generation and manipulation of vectors and characters for real-time display. Data structures for picture and text processing.

Prerequisite: CS 233, EE 342/642.

Credit, 3.

662. SELF-ORGANIZING SYSTEMS
AND PATTERN RECOGNITION.

Several aspects of self-organizing systems and pattern recognition including machine intelligence, adaptation, learning, and self repair.

Credit, 3.

666. ANALOG AND HYBRID
COMPUTERS.

Designed for computer science or engineering students interested in the hybrid computer as a computational tool. Review of analog and digital computers and their combination.

Prerequisite, permission of instructor.

Credit, 3.

668. ADVANCED SWITCHING
THEORY.

Topics of contemporary interest in digital switching theory and logical design. State-of-the-art techniques in computer hardware design.

Prerequisite, EE 210/510.

Credit, 3.

English

GRADUATE FACULTY

Joseph Frank, *Head of the Department and Professor of English*, B.A., Harvard, 1939; M.A., 1947; Ph.D., 1953.

Robert P. Creed, *Director of Graduate Studies and Professor of English*, Swarthmore College, 1948; M.A., Harvard, 1949; Ph.D., 1956.

Tamas Aczel, *Associate Professor of English*, B.A., University of Budapest, 1948; M.A., 1950.

Russell K. Alspach, *Professor of English*, B.A., University of Pennsylvania, 1924; M.A., 1931; Ph.D., 1932.

Gary L. Aho, *Assistant Professor of Eng-*

lish, B.S., Portland State College, 1959; Ph.D., University of Oregon, 1966.

Jeremiah Allen, *Associate Provost and Professor of English*, B.A., Duke University, 1947; M.A., Tufts University, 1948; Ph.D., University of Colorado, 1956.

Thomas W. Ashton, *Assistant Professor of English*, B.A., City College of New York, 1963; M.A., 1964; Ph.D., Columbia, 1969.

Robert E. Bagg, *Associate Professor of English*, B.A., Amherst College, 1957; M.A., University of Connecticut, 1961; Ph.D., University of Washington, 1965.

Ellsworth Barnard, *Professor of English*, B.S., University of Massachusetts, 1928; M.A., University of Minnesota, 1929; Ph.D., 1935.

Normand Berlin, *Associate Professor of English*, B.A., New York University, 1953; M.A., Columbia, 1956; Ph.D., California at Berkeley, 1964.

Howard O. Brogan, *Commonwealth Professor of English*, B.A., Grinnell College, 1936; M.A., State University of Iowa, 1938; Ph.D., Yale, 1941.

Marie Campbell, *Professor of English*, B.A., Southern Illinois, 1932; M.A., George Peabody College, 1937; Ph.D., Indiana, 1956.

Jules Chametzky, *Professor of English*, B.A., Brooklyn College, 1950; M.A., Minnesota, 1952; Ph.D., 1958.

Donald S. Cheney, *Associate Professor of English*, B.A., Yale, 1954; M.A., 1957; Ph.D., 1961.

David R. Clark, *Professor of English*, B.A., Wesleyan University, 1947; M.A., Yale, 1950; Ph.D., 1955.

John Clayton, *Associate Professor of English*, B.A., Columbia College, 1956; M.A., New York University, 1959; Ph.D., Indiana University, 1966.

Thomas W. Copeland, *Commonwealth Professor of English*, B.A., Yale, 1928; Ph.D., 1933.

Audrey R. Duckert, *Associate Professor of English*, B.A., Wisconsin, 1948; M.A., 1949; Ph.D., Radcliffe College, 1959.

Everett H. Emerson, *Professor of English*,

- B.A., Harvard 1948; M.A., Duke, 1949; Ph.D., Louisiana State, 1955.
- Andrew Fetler, *Associate Professor of English*, B.S., Loyola, 1959; M.F.A., State University of Iowa, 1964.
- Ernest Gallo, *Associate Professor of English*, B.A., St. John's University, 1954; M.A., New York University, 1957; Ph.D., 1965.
- Walker Gibson, *Professor of English*, A.B., Yale, 1940; M.A., University of Iowa, 1946.
- Morris Golden, *Professor of English*, B.A., City College of New York, 1948; M.A., New York University, 1949; Ph.D., 1953.
- Richard Haven, *Professor of English*, B.A., Harvard, 1948; M.A., Princeton, 1952; Ph.D., 1958.
- Vernon P. Helming, *Professor of English*, B.A., Carleton, 1925; Ph.D., Yale, 1937.
- John H. Hicks, *Associate Professor of English*, B.A., Middlebury, 1941; M.A., Boston University, 1952; Ph.D., 1961.
- Priscilla G. Hicks, *Assistant Professor of English*, B.A., Wellesley, 1948; M.A., University of Michigan, 1949; Ph.D., Boston University, 1960.
- Ernest H. Hofer, *Associate Professor of English*, A.B., Brown, 1945; M.A., 1947; Ph.D., Cornell, 1959.
- Floriana T. Hogan, *Assistant Professor of English*, B.S., Boston University, 1940; M.A., 1941, Ph.D., 1955.
- Donald Junkins, *Associate Professor of English*, B.A., University of Massachusetts, 1953; S.T.B., Boston University, 1955; S.T.M., 1957; A.M., 1959; Ph.D., 1963.
- Sidney Kaplan, *Professor of English*, B.A., College of the City of New York, 1942; M.A., Boston University, 1948; Ph.D., Harvard, 1959.
- Richard E. Kim, *Adjunct Associate Professor of English*, M.A., Johns Hopkins, 1960; M.F.A., State University of Iowa, 1962; M.A., Harvard, 1963.
- Arthur Kinney, *Associate Professor of English*, B.A., Syracuse, 1955; M.S., Columbia, 1956; Ph.D., University of Michigan, 1963.
- G. Stanley Koehler, *Professor of English*, B.A., Princeton, 1936, M.A., Harvard, 1937; M.A., Princeton, 1938; Ph.D., 1942.
- Joseph Langland, *Professor of English*, B.A., State University of Iowa, 1940; M.A., 1941.
- Simon O. Lesser, *Lecturer in English*, Ph.B., Chicago, 1929.
- Mason I. Lowance, Jr., *Assistant Professor of English*, B.A., Princeton University, 1960; B.A., Oxford University, 1964; M.A., 1966; Ph.D., Emory University, 1967.
- Paul L. Mariani, *Assistant Professor of English*, B.A., Manhattan College, 1962; M.A., Colgate University, 1964; Ph.D., City University of New York, 1967.
- Milton Mayer, *Professor of English*.
- Jerome Meckier, *Assistant Professor of English*, A.B., Le Moyne, 1963; M.A., Harvard, 1964; Ph.D., 1968.
- Harold T. McCarthy, *Associate Professor of English*, B.A., Massachusetts, 1941; M.A., Harvard, 1942; Ph.D., 1950.
- John H. Mitchell, *Professor of English*, B.S., Bowdoin, 1943; M.A., Harvard, 1947.
- Richard W. Noland, *Assistant Professor of English*, A.B., Emory, 1954; M.D., 1958; M.A., Columbia, 1961.
- William G. O'Donnell, *Professor of English*, B.S., Massachusetts, 1938; M.A., Yale, 1940; Ph.D., 1942.
- Alex Page, *Professor of English*, B.A., Vermont, 1948; M.A., Harvard, 1949; Ph.D., 1953.
- Arthur W. Plumstead, *Associate Professor of English*, B.A., Western Ontario, 1955; M.A., Rochester, 1957; Ph.D., 1960.
- Dario Politella, *Associate Professor of English*, A.B., Massachusetts, 1947; M.S., Syracuse, 1949; Ph.D., 1965.
- Gregory T. Polletta, *Assistant Professor of English*, B.A., University of Connecticut, 1951; M.A., 1953; M.A., Princeton University, 1959; Ph.D., 1961.
- David T. Porter, *Associate Professor of English*, A.B., Hamilton, 1950; Ph.D., Rochester, 1963.

Meredith B. Raymond, *Associate Professor of English*, B.S., Bridgewater State College, 1939; M.A., Middlebury College, 1943; Ph.D., Boston University, 1964.

Seymour Rudin, *Associate Professor of English*, B.A., City College of New York, 1941; M.S., 1943; Ph.D., Cornell, 1953.

Paul F. Saagpakk, *Associate Professor of English*, Ph.D., Columbia, 1966.

Paul S. Sanders, *Associate Professor of English*, B.A., Alabama, 1939; B.D., Emory, 1942; S.T.M., Union Theological, 1947; Th.D., 1954.

Arnold J. Silver, *Associate Professor of English*, B.A., New York University, 1947; M.A., Columbia, 1948; Ph.D., 1958.

Bernard Spivack, *Professor of English*, B.A., Alabama, 1931; M.A., Harvard, 1932; Ph.D., Columbia, 1950.

Charlotte K. Spivack, *Associate Professor of English*, B.A., New York State University at Albany, 1947; M.A., Cornell, 1948; Ph.D., University of Missouri, 1954.

John J. Teunissen, *Assistant Professor of English*, B.A., University of Saskatchewan, 1960; M.A., 1962; Ph.D., University of Rochester, 1967.

Robert G. Tucker, *Associate Professor of English*, B.A., Amherst, 1949; M.A., Harvard, 1951; Ph.D., State University of Iowa, 1961.

Frederick W. Turner, III, *Assistant Professor of English*, B.A., Denison, 1959; M.A., Ohio State, 1961; Ph.D., Pennsylvania, 1965.

H. Leland Varley, *Professor of English*, B.A., Wesleyan, 1934; M.A., 1935; Ph.D. Wisconsin, 1953.

John C. Weston, Jr., *Professor of English*, M.A., Chicago, 1950; Ph.D., North Carolina, 1956.

Michael Wolff, *Professor of English*, B.A., Cambridge, 1948; M.A., St. John's College, 1955; Ph.D., Princeton University, 1958.

ASSOCIATED FIVE-COLLEGE GRADUATE FACULTY

Richard C. Lyon, *Dean of Hampshire College and Professor of English in American Studies*, B.A., University of Texas, 1951; B.A., Cambridge, England, 1953; M.A., Cambridge, England, 1955; M.A., University of Connecticut, 1958; Ph.D., University of Minnesota, 1962.

UNIVERSITY OF MASSACHUSETTS/BOSTON GRADUATE FACULTY

Alfred R. Ferguson, *Professor of English*, B.A., College of Wooster, 1937; M.A., 1942; Ph.D., Yale, 1948.

Richard McCleary, *Assistant Professor of English*, M.A., University of Chicago, 1954; Ph.D., Yale, 1961.

Alvan S. Ryan, *Professor of English*, B.S., University of Massachusetts, 1934; M.A., Harvard, 1938; Ph.D., State University of Iowa, 1940.

Irvin Stock, *Professor of English*, B.A., New York University, Washington Square College, 1940; M.A., Columbia Teachers College, 1941; Ph.D., 1953.

PH.D. FOREIGN LANGUAGE REQUIREMENTS

The Department requires proficiency in one foreign language to be demonstrated by successful completion of two graduate courses in comparative literature or by successfully completing one graduate-level course in the area of the language chosen; or proficiency in two foreign languages, to be demonstrated by passing the standard foreign language examinations. Transfer students must fulfill this requirement according to these standards, unless they have been certified as to language proficiency before arrival; others may have partially fulfilled the requirement while earning the master's degree.

All graduate students should secure from the Department of English detailed information or requirements for the degrees.

COURSES OPEN TO GRADUATE
STUDENTS ONLY

416. ENGLISH FOR FOREIGN
STUDENTS. *No Credit.* Staff.

700. SPECIAL PROBLEMS.
For students wishing to do special work not
covered by courses listed in the curriculum.
Permission must be secured from the Direc-
tor of Graduate Studies and the instructor
under whom the study will be done. The
latter will supervise and evaluate the work.
Credit, 2-6. Staff.

701. HISTORY OF THE
ENGLISH LANGUAGE.
Development of the English Language.
Consideration of continuing as well as ac-
complished changes and variations in
sounds, forms, and usage. Survey of dic-
tionaries and grammars in context of teach-
ing. *Credit, 3.* Miss Duckert.

702. OLD ENGLISH.
Introduction to Old English.
Credit, 3 Mr. Creed,
Miss Duckert, Mr. Aho.

703. MIDDLE ENGLISH.
The language and documents representing
the chief dialects. *Credit, 3.* Mr. Helming.

705. OLD ENGLISH LITERATURE.
Reading of various Old English works,
stressing Beowulf.
Prerequisite, English 702, or equivalent.
Credit, 3. Mr. Creed, Miss Duckert.

706. MIDDLE ENGLISH LITERATURE.
Representative poems, verse plays, and se-
lected prose, exclusive of Chaucer.
Prerequisite, English 703, or equivalent.
Credit, 3. Mr. Helming.

707. THE WORKS OF CHAUCER'S
FRENCH AND ITALIAN
PERIODS.
The complaints, the dream-visions, the later
short poems, *Boethius*, and *Troilus* as com-
binations of medieval art and thought with
Pre-Renaissance motifs.
Credit, 3. Mr. Gallo.

708. CHAUCER.
Chaucer's *Canterbury Tales* and the critical
problems implicit in his works.
Credit, 3. Mr. Gallo.

710. HISTORICAL STUDIES IN THE
LANGUAGE OF LITERATURE.
The linguistic milieu in which monuments
of British and American literature were cre-
ated, with emphasis on matters critical to
accurate reading, e.g., semantic shifts,
changes in syntax and rhyme, regional and
social variations. Examination of selected
works according to interests of the class.
Credit, 3. Miss Duckert.

712. STUDIES IN RHETORIC
AND PROSE STYLE.
Brief readings in Plato and Aristotle as well
as in the "new rhetorics" of our own time.
Detailed problems in the study of style:
words and meanings, the implications of
sentence structures, irony, metaphor, the
cliché. *Credit, 3.* Mr. Gibson.

718. THE ENGLISH LITERARY
PROFESSION.
An introduction to the professional stand-
ards, aims, and procedures of scholarship
and criticism.
Credit, 3. Mr. Kinney and staff.

721. THE DEVELOPMENT OF
THE ENGLISH NOVEL.
Readings in the English novel to the late
19th Century, from Richardson to Conrad,
with special attention to some ten represen-
tative novels.
Credit, 3. Mr. Page, Mr. Golden.

730. LITERATURE OF THE
16TH CENTURY.
Christian and Humanist ideals reflected in
the poetry of Skelton, Wyatt, Surrey, Sack-
ville, Raleigh, Sidney, and Spenser.
Credit, 3. Mr. Spivack, Mr. Kinney.

731. THE ENGLISH BIBLE AS
LITERATURE.
The several main genres of Biblical litera-
ture in their historical setting with attention
to principles in interpretation; the literary in-
fluence of the Authorized Version.
Credit, 3. Mr. Sanders.

732. SHAKESPEARE.
Close examination of Shakespearian plays
representing the characteristics of his dra-
matic art.
Credit, 3. Mr. Spivack,
Mrs. Spivack, Mr. Berlin.

734. ELIZABETHAN AND
JACOBEAN DRAMA.

Representative plays by Shakespeare's contemporaries, 1580-1642; special emphasis on works by Marlowe, Jonson, Beaumont and Fletcher, and Ford.

Credit, 3. Mrs. Spivack, Mr. Berlin.

737. LITERATURE OF THE
17TH CENTURY.

Readings in 17th Century prose and poetry from Donne to Marvell; analysis of the more significant areas of thought and style.

Credit, 3. Mr. Frank,
Mr. Koehler, Mr. Cheney.

738. MILTON.

The major and some of the minor works of Milton, as well as related studies in Milton scholarship and criticism.

Credit, 3. Mr. Koehler, Mr. Teunissen.

740. LITERATURE OF THE RESTORA-
TION AND 18TH CENTURY.

Readings in English poetry and prose from Dryden to Burns, emphasizing the major writers and including representative plays.

Credit, 3. Mr. Golden, Mr. Weston.

745. LITERATURE OF THE
ROMANTIC PERIOD.

Readings in the major poetry, representative essays, and selected critical writings, including Blake, Coleridge, Wordsworth, Keats, Shelley, Byron, and Hazlitt.

Credit, 3. Mr. Haven, Mr. Brogan,
Mr. Barnard, Mr. Ashton.

746. LITERATURE OF THE
VICTORIAN AGE.

Readings in the chief poets and prophets of the Victorian age, with emphasis on Browning, Tennyson, Carlyle, Newman, Mill, Ruskin, Arnold, and Pater.

Credit, 3. Mr. Wolff, Mr. Silver,
Mr. Noland, Mrs. Raymond.

750. COLONIAL AMERICAN
LITERATURE.

A study of the major writers and intellectual movements in America during the 17th and 18th Centuries.

Credit, 3. Mr. Emerson, Mr. Lowance.

753. AMERICAN ROMANTICISM.

The development of American romanticism, under European influence, stressing Cooper,

Emerson, Thoreau, Poe, Hawthorne, Whitman, and Melville.

Credit, 3. Mr. Kaplan, Mr. McCarthy,
Mr. Emerson, Mr. Plumstead.

755. AMERICAN REALISM.

The development of American realism from 1865 to 1914, stressing Twain, Henry James, Howells, and Henry Adams.

Credit, 3. Mr. O'Donnell, Mr. Turner.

770. CONTEMPORARY DRAMA.

British and American drama from 1950 to the present.

Credit, 3. Mr. Rudin.

771. CONTEMPORARY FICTION.

British and American fiction from 1945 to the present.

Credit, 3. Mr. Moran,
Mr. Powers, Mr. Nelson.

772. CONTEMPORARY POETRY.

British and American poetry from 1945 to the present.

Credit, 3. Mr. Langland, Mr. Tucker,
Mr. Junkins, Mr. Bagg.

774. LITERARY CRITICISM.

Critical theory and practice with emphasis on the major philosophical critics beginning with Plato and Aristotle.

Credit, 3. Mr. Copeland, Mr. Clark.

775. MODERN DRAMA.

Modern British, Irish, and American drama from 1890 to 1950. Emphasis on major figures: Shaw, Synge, O'Neill.

Credit, 3. Mr. Rudin, Mrs. Hogan.

776. MODERN FICTION.

Intensive study, including papers and oral reports, of important works by Henry James, Joseph Conrad, James Joyce, D. H. Lawrence, William Faulkner and other masters of the modern novel between about 1900 and 1940.

Credit, 3. Mr. Chametzky,
Mr. Clayton, Mr. Hicks.

777. MODERN POETRY.

The growth and development of modern poetry in English from 1912 to WW II, including those poets who came to prominence during that period: Yeats, Stevens, Frost, Eliot, Pound, Williams; also Cummings, L. Hughes, Moore, Ransom, Auden, Crane, Robinson. Brief background materi-

als out of Hopkins, Dickinson and Hardy.
Credit, 3. Mr. Clark, Mr. Koehler,
Mr. Mariani.

780. IMAGINATIVE WRITING.

Writer's workshop, with emphasis upon poetry. May be repeated by candidates for the M.F.A. for a total of 12 credits.

Credit, 3. Mr. Langland,
Mr. Tucker, Mr. Junkins.

781. IMAGINATIVE WRITING.

Writer's workshop, with emphasis upon fiction. May be repeated by M.F.A. candidates for a total of 12 credits.

Credit, 3. Mr. Fetler,
Mr. Swados, Mr. Aczel.

790. FOLKLORE.

Folk narrative: tale, myth, and legend in relation to written literature.

Credit, 3. Miss Campbell, Mr. Turner.

800. MASTER'S THESIS.

May be repeated by M.F.A. candidates for a total of 12 credits. *Credit, 3-9.*

810-819. SEMINARS IN ENGLISH LITERATURE.

Credit, 3 each semester. Staff.

820-829. SEMINARS IN THE ENGLISH LANGUAGE.

Credit, 3 each semester. Staff.

830-839. SEMINARS IN AMERICAN LITERATURE.

Credit, 3 each semester. Staff.

840-849. SEMINARS IN CRITICISM.

Credit, 3 each semester. Staff.

850-859. SEMINARS IN EDITING.

Credit, 3 each semester. Staff.

860-869. SEMINARS IN WRITING.

Credit, 3 each semester. Staff.

870-879. SEMINARS IN LINGUISTICS.

Credit, 3 each semester. Staff.

900. DOCTORAL DISSERTATION.

Credit, 15-30.

634. ADVANCED TECHNICAL WRITING.

Case studies in engineering and industrial

reporting, advertising, and promotional literature, scientific journalism, and graphic techniques. Given in alternate years. Prerequisite, permission of instructor.

Credit, 3. Mr. Mitchell.

RELATED COURSES

Comparative Literature

Descriptions of these courses appear under "Comparative Literature Program," p. 105.

The Program in Comparative Literature offers graduate work leading to the Master of Arts and Doctor of Philosophy degrees. Facilities and staff for concentrants in classical tradition studies, medieval, Renaissance, Enlightenment, romantic, modern and contemporary European literature are available. Graduate training prepares students for University teaching and research, as well as for the teaching of general and world literature courses at the college level.

Entomology

GRADUATE FACULTY

T. Michael Peters, *Head of the Department and Associate Professor of Entomology*, B.S., Long Beach State College, 1959; M.S., Minnesota, 1961; Ph.D., 1964.

William B. Becker, *Professor of Entomology*, B.S., New York State College of Forestry at Syracuse University, 1934; M.S., Massachusetts, 1937; Ph.D., 1945.

Lawrence J. Edwards, *Assistant Professor of Entomology*, B.S., State University of New York, 1962; M.S., Cornell, 1965; Ph.D., 1967.

John F. Hanson, *Professor of Entomology*, B.S., Massachusetts, 1937; M.S., 1938; Ph.D., 1943.

Gary L. Jensen, *Assistant Professor of Entomology*, B.S., Brigham Young University, 1962; M.S., 1963; Ph.D., University of California, Berkeley, 1968.

John H. Lilly, *Professor of Entomology*, B.S., Wisconsin, 1931; Ph.D., 1935.

William D. McEnroe, *Associate Professor of Entomology*, B.S., Connecticut, 1950; M.S., 1952; Ph.D., Rutgers, 1956.

John A. Naegele, *Professor of Entomology*, B.S., Cornell, 1949; Ph.D., 1952.

Marion E. Smith, *Associate Professor of Entomology*, B.S., Massachusetts, 1935; M.S., 1936; Ph.D., Illinois, 1938.

John G. Stoffolano, *Assistant Professor of Entomology*, B.S., State University of New York at Oneonta, 1962; M.S., Cornell, 1967; Ph.D., Connecticut, 1970.

William E. Tomlinson, Jr., *Professor of Entomology*, B.S., Tufts, 1936; M.S., Massachusetts, 1938.

William D. Tunis, *Professor of Entomology*, B.S., Massachusetts, 1949; M.S., Minnesota, 1951; Ph.D., Massachusetts, 1959.

UNIVERSITY OF MASSACHUSETTS/BOSTON GRADUATE FACULTY

Ruth R. Bennett, *Assistant Professor of Entomology*, B.S., Tufts, 1956; Ph.D., 1965.

James N. Weaver, *Professor of Biology*, A.B., Southwestern University, 1941; M.S., Texas A. & M., 1943; Ph.D., 1953.

A candidate for the M.S. degree in Entomology, in addition to meeting the requirements of the Graduate School, must ordinarily complete the course requirements of Ent. 655, 656, 657, 680, 682, and related sciences or their equivalents, plus Ent. 579, 770, and other courses assigned by the student's adviser. A thesis is usually required, but in special cases course credits in the 700-800 series, including at least three credits in Ent. 700, may be substituted.

Requirements for the Ph.D. degree include the course requirements for the M.S. degree, as well as those established by the Graduate School and by the student's Guidance Committee. Journal level reading competency in one foreign language will be determined by a Departmental committee.

JOINT Ph.D. PROGRAM IN ENTOMOLOGY AND PLANT PATHOLOGY.

The following curriculum is designed to provide the training necessary for research, instruction, and the solution of complex problems in entomology and plant pathology such as the transmission of plant diseases by insects and the control of plant pests generally. In this interdisciplinary area there are many opportunities in industry, extension, teaching and in basic biological research.

Curriculum. Courses required for the completion of this program include (a) general background courses and (b) specific advanced courses or their equivalent: (a) general botany, one year; chemistry, one year of inorganic and one of organic; foreign language; mathematics, one year; physics, one year; statistics; and zoology, one year, including genetics. (b) Entomology 126, 655, 657, 680, 682, 770; Plant Pathology 551, 575, 661, 680, 805, 806; Botany 126, 511, 521, 531, 581, 591.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

(Most graduate level courses in the department are given on a rotating basis, subject to change on student demand.)

700. SPECIAL PROBLEMS.

Research on some problem in Entomology. If submitted in lieu of a thesis, original research is expected, and two copies of a written report, approved by two members of the staff, are required by the Department.

Credit, 1-6 per semester. Staff.

705. PRINCIPLES OF PLANT PROTECTION.

Fundamentals of insecticidal action, natural factors governing insect abundance and activity, infection and disease development, chemical control, cultural practices, quarantine and eradication, host resistance and

pathogen variability and weed control.
Offered only at the Waltham Field Station.

Credit, 3. Staff.

745. HISTORICAL ENTOMOLOGY.

Lives and works of outstanding entomologists of the world, history of entomology.
Prerequisite, permission of instructor.

Credit, 2. Mr. Lilly.

770. RESEARCH METHODS.

An orientation course for incoming graduate students which stresses research principles, methods of analysis, and presentation of results.

Credit, 2. Staff.

790. SEMINAR.

Reports on the current literature of entomology; special reports by resident and visiting speakers. Participation by all graduate students is expected.

One class hour.

(Maximum for M.S. Candidates, 2;

Maximum for Ph.D. Candidates, 4)

Credit, 1 each semester. Staff.

800. MASTER'S THESIS. *Credit, 10.*

803. INSECT EMBRYOLOGY.

The embryological development of a generalized type of insect, after which specific insects are considered. Lectures, assigned readings, laboratory work.

Prerequisite, Ent 657.

Credit, 2. Mr. Stoffolano

811. INSECT BEHAVIOR.

The honey bee as a type for the study of behavior; interpretations of the reasons for the actions of this insect. Other species may be included for completeness.

Prerequisites, Ent 126 and 566 or equivalent.

Credit, 3. Staff.

814. ADVANCED ANIMAL ECOLOGY.

Basic principles of terrestrial, limnological, and marine ecology, with special emphasis on the influence of causal factors, both physical and biotic, that regulate the activities of all organisms.

Prerequisite, Ent 579 or equivalent.

Credit, 3. Mr. Peters.

821. INSECT TOXICOLOGY.

The chemistry of insecticides and their physiological effects on insects, man and other animals.

Prerequisite, permission of instructor.

Credit, 3. Mr. Edwards.

823. ADVANCED BIOLOGICAL CONTROL.

The basic fundamental principles, as well as practical application of biological control of insects. A section devoted to control of pest weeds with insects.

Prerequisite, Ent 680 or equivalent.

Credit, 3. Staff.

842. ADVANCED ARTHROPOD TAXONOMY.

Classification of selected insects and insect allies, including latest methods in taxonomy and principles of classification.

Prerequisite, permission of the instructor.

Credit, 1-9. Staff.

A. Culcidae *Miss Smith.*

B. Immature stages of
insects *Miss Smith.*

C. Minor orders of
insects *Mr. Hanson.*

D. Arthropods other than
insects *Mr. Hanson.*

E. Other groups of insects *Staff.*

848. PRINCIPLES OF SYSTEMATIC ENTOMOLOGY.

The species concept: type categories; the Zoological Code. The preparation of a taxonomic paper of publication quality, including drawing, required.

Prerequisites, Ent 655, 656.

Credit, 3. Mr. Hanson.

850. ADVANCED MEDICAL ENTOMOLOGY.

Detailed studies of insects as parasites of man and animals. Biology, vector-relationship, taxonomy and control.

Prerequisite, Ent 674 or equivalent.

Credit, 3. Mr. Hall.

900. DOCTORAL DISSERTATION.

Credit, 30.

COURSES OPEN TO BOTH
GRADUATE AND UNDER-
GRADUATE STUDENTS

(For either major or minor credit)

566. APICULTURE.

Honeybees and their relatives; structure, behavior and biology of bees; bee management, diseases, queen rearing, and honey production; history of apiculture.

Two class hours. One 2-hour laboratory period.

Prerequisite, Ent 126 or permission of instructor.

Credit, 3. Mr. Edwards.

572. FOREST AND SHADE
TREE INSECTS.

The principles and methods of controlling insects which attack shade trees, forests and forest products. The more important species, their identification, biology, and specific control measures.

Two class hours, two 2-hour laboratory periods.

Credit, 4. Mr. Becker.

579. ANIMAL ECOLOGY.

Relations of animals to their physical and biotic environment, with observation and quantitative measurement of these factors and responses in the field and laboratory.

Two class hours, one 2-hour laboratory period.

Prerequisite, a course in entomology or zoology.

Credit, 3. Mr. Stoffolano.

590. EVOLUTION.

The course and dynamics of both inorganic and organic evolution are treated, as are the implications of evolutionary concept on human philosophy, behavior and welfare.

Credit, 3. Mr. Hanson.

655, 656. CLASSIFICATION
OF INSECTS.

The identification of insects, including immature stages. First semester: Orthoptera, Hemiptera, Coleoptera; second semester: other orders. Either semester may be elected independently.

Three 2-hour laboratory periods.

Prerequisite, permission of instructor; Ent 126 desirable.

Credit, 3. Miss Smith.

657. INSECT MORPHOLOGY.

The external and internal anatomy of the major orders, with stress on phylogenetic relationships, as background for subsequent work in taxonomy and physiology of insects. One class hour, three 2-hour laboratory periods.

Prerequisite, permission of instructor; Ent 126 desirable.

Credit, 4. Mr. Hanson.

674. MEDICAL AND VETERINARY
ENTOMOLOGY.

Relationships of insects and their allies to the health of man and animals. The classification, biology and control of these pests. One class hour, two 2-hour laboratory periods.

Prerequisite, Ent 126 or permission of instructor.

Credit, 3. Mr. Hall.

680. INSECT CONTROL.

The science of pest control. Biological control, and the need, economics, effectiveness and hazards from insecticides are emphasized.

Prerequisite, Ent 126; 579 and 682 desirable.

Credit, 3. Mr. Lilly.

681. ECONOMIC
ENTOMOLOGY I.

Application of the principles of insect pest management with emphasis on past recognition, properties of available control agents and their correct use in planning control programs.

Prerequisite, Ent 680, Ent 126 desirable, or permission of instructor.

Credit, 3. Mr. Jensen.

682. INSECT PHYSIOLOGY.

Detailed consideration of the organ systems, showing their functions in nutrition, reproduction, respiration, and growth, and the relationship of physiology to behavior.

One class hour, two 2-hour laboratory periods.

Prerequisite, Ent 126 and permission of instructor.

Credit, 4. Mr. Edwards.

COURSES NOT FOR
MAJOR CREDIT

(No graduate credit for students majoring in Entomology)

560. FOOD AND STRUCTURAL PESTS. Biology, recognition, damage and principles of control are stressed for those insects and other pests which damage foods, fabrics and buildings.

A prior course in zoology or entomology desirable.

Credit, 3. Mr. Lilly.

Environmental Engineering Program

GRADUATE FACULTY

(See under Civil and Chemical Engineering and Public Health for degrees, institutions, and years.)

Tsuan H. Feng, *Director of the Program and Professor of Civil Engineering and Agricultural Engineering.*

Donald Dean Adrian, *Associate Professor of Civil Engineering.*

Bernard B. Berger, *Director of Water Resources Research Center, and Professor of Civil Engineering and Public Health.*

Joseph M. Colonell, *Associate Professor of Civil Engineering.*

Francis A. DiGiano, *Assistant Professor of Civil Engineering.*

George R. Higgins, *Associate Professor of Civil Engineering.*

Lawrence N. Kuzminski, *Assistant Professor of Civil Engineering.*

E. Ernest Lindsey, *Professor of Chemical Engineering.*

Howard A. Peters, *Assistant Professor of Public Health and Civil Engineering.*

Roscoe F. Ward, *Assistant Dean of School of Engineering and Associate Professor of Civil Engineering.*

The overall objective of this program is to prepare students for careers in engineering related to development of a more livable environment. Emphasis is placed on modern techniques to restrain and counter the rapid acceleration of pollution of the land, air and water resource. Interdisciplinary solutions are stressed, although not to the exclusion of traditional sanitary engineering concepts.

The following elective Fields of Study with the required courses are:

1. Environmental Quality Engineering: Technology for examining, evaluating and controlling environmental quality and pollution.

CE (Civil Engineering) 671, 672, 673, 771, 772, 775.

2. Environmental Resources Engineering: Fundamental relationships between environmental quality, economics, and resources.

CE 660, 662, 665, 763, 775, Agricultural and Food Economics 582.

3. Environmental Health Engineering: Planning, organizing, and managing of environmental health engineering programs.

CE 672, 673, 771, 776, Public Health 561, 632.

4. Air Pollution Engineering: Technology for examining, evaluating and controlling air quality and pollution.

CE 672, 673, 700, 772, 776, Chem. Eng. 640, Public Health 640.

The Department of Civil Engineering offers a selection of electives in Environmental Engineering including CE 561, 571, 674, 675, 676, 700, 764, 770, and 774. For course descriptions refer to the Department of Civil Engineering in this bulletin.

Although the program is administered by the Department of Civil Engineering, non-engineers are encouraged to apply. Students with degrees from any of the following disciplines are eligible: engineering, physical science, natural science, social science, and public health.

All general Graduate School requirements for admission and for the degree must be met with the following additional requirements:

1. For the M.S. degree in Environmental Engineering, the candidate must satisfy the curricula of one of the four Fields of Study above: Environmental Quality Engineering, Environmental Resources Engineering, Environmental Health Engineering, and Air Pollution Engineering.

A total of 31 credits must be earned, six of which may be for a thesis.

2. The candidate for the Ph.D. degree must satisfy the curricula of two Fields of Study. In total, 48 credits of approved graduate level course work beyond the bachelor's degree, and 30 credits of dissertation are required. Two minors are required, which will normally provide a minimum of 18 of the required credits. Areas suitable for minors include:

- a. Chemical, Biological, or Physical Science
- b. Mathematics, Computer Science or Statistics
- c. Chemical Engineering or Agricultural Engineering
- d. Systems analysis, which may include courses offered in Industrial, Chemical, Electrical and Mechanical Engineering
- e. Public Health or Environmental Science
- f. Economics, Planning, and Management

In lieu of the language requirement three approved courses, in either the humanities and/or social sciences (including foreign languages), must be taken with grades of C or better. These need not be taken before the preliminary comprehensive examination.

3. Individuals with non-engineering backgrounds are required to attain a certain level of proficiency in the following areas:

- (a) Mathematics through Analytical Geometry and Calculus (Math 186) and one of the following courses: Comp. Sci. 251, Math 187, 233, or 343.
- (b) General Chemistry
(Chem. 111 and 112)
- (c) Introductory Physics
(Physics 121 and 122)
- (d) Statics (CE 140)
- (e) Fluid Mechanics (CE 257)
- (f) Fluid Mechanics Laboratory*
(CE 258)

(g) Engineering Hydraulics*
(CE 260)

(h) Basic Environmental Engineering
(CE 270)

More detailed information may be secured from the program director.

*Not required for the Air Pollution Option

Food Science and Technology

GRADUATE FACULTY

William B. Esselen, *Head of the Department of Food Science and Technology, and Professor of Food Technology*, B.S., Massachusetts, 1934; M.S., 1935; Ph.D., 1938.

Ernest M. Buck, *Associate Professor of Food Science and Technology*, B.S., University of Connecticut, 1955; M.S., North Carolina State, 1957; Ph.D., Massachusetts, 1966.

Fergus M. Clydesdale, *Assistant Professor of Food Science and Technology*, B.A., Toronto, 1960; M.S., 1962; Ph.D., Massachusetts, 1966.

David A. Evans, *Assistant Professor of Food Science and Technology*, B.S., Pennsylvania State, 1953; M.S., 1955; Ph.D., Massachusetts, 1968.

Irving S. Fagerson, *Professor of Food Science and Technology*, B.S., Massachusetts Institute of Technology, 1942; M.S., Massachusetts, 1948; Ph.D., 1950.

Frederick J. Francis, *Nicolas Appert Professor of Food Science and Technology*, B.A., University of Toronto, 1946; M.A., 1948; Ph.D., Massachusetts, 1954.

Denzel J. Hankinson, *Professor of Food Science and Technology*, B.S., Michigan State, 1937; M.S., Connecticut, 1939; Ph.D., Pennsylvania State 1942.

Kirby M. Hayes, *Professor of Food Science and Technology*, B.S., Massachusetts, 1947; M.S., 1948.

Herbert O. Hultin, *Professor of Food Science and Technology*, B.S., Massa-

chusetts Institute of Technology, 1956; M.S., 1956; Ph.D., 1959.

Ward M. Hunting, *Assistant Professor of Food Science and Technology*, B.S., Houghton College, 1947; M.S., Massachusetts, 1949; Ph.D., 1963.

Robert E. Levin, *Associate Professor of Food Science and Technology*, B.S., Los Angeles State College, 1952; M.S., Southern California, 1954; Ph.D., California, 1963.

Thomas R. Mulvaney, *Associate Professor of Food Science and Technology*, B.S., Michigan State, 1956; M.S., 1959; Ph.D., 1962.

Wassef W. Nawar, *Professor of Food Science and Technology*, B.S., University of Cairo, 1947; M.S., 1950; Ph.D., Illinois, 1960.

Frank E. Potter, *Associate Professor of Food Science and Technology*, B.S., Maine, 1942; M.S., Maryland, 1948; Ph.D., Pennsylvania State, 1955.

F. Miles Sawyer, *Associate Professor of Food Science and Technology*, B.S., Massachusetts Institute of Technology, 1948; M.S., California, 1951; Ph.D., 1958.

Charles R. Stumbo, *Professor of Food Science and Technology*, B.S., Kansas State, 1936; M.S., 1937; Ph.D., 1941.

INSTITUTE OF AGRICULTURAL AND INDUSTRIAL MICROBIOLOGY

Warren Litsky, *Director of Agricultural and Industrial Microbiology and Commonwealth Professor of Environmental Sciences*, B.A., Clark University, 1945; M.S., Massachusetts, 1948; Ph.D., Michigan State, 1951.

Haim B. Gunner, *Associate Professor of Agricultural and Industrial Microbiology*, B.S., University of Toronto, 1946; M.S., University of Manitoba, 1948; Ph.D., Cornell, 1962.

William S. Mueller, *Associate Professor of Agricultural and Industrial Microbiology*, B.S., Illinois, 1927; M.S., Rutgers, 1928; Ph.D., Massachusetts, 1939.

Robert W. Walker, *Research Instructor in Agricultural and Industrial Microbiology*, B.S., Massachusetts, 1955; M.S., 1959; Ph.D., Michigan State, 1963.

Graduate students who wish to major in food science and technology may not be admitted to candidacy for an advanced degree until such time as the undergraduate requirements in basic sciences and department courses have been met substantially. Work in the area of dairy technology is included in the offerings of the Department of Food Science and Technology.

Industrial microbiology is offered as an area of concentration for the Ph.D. degree in the Department of Food Science and Technology in cooperation with the Institute of Agricultural and Industrial Microbiology.

The Department of Food Science and Technology requires no foreign language reading competency for the doctoral degree.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. RESEARCH PROBLEM.

Mainly for candidates for the Master of Science degree who do not write a thesis. Original research expected. Two bound copies of a written report of the study are required by the department.

Credit, 3-6. Staff.

703. RESEARCH PROJECT.

Research on problems not related to the thesis. For Ph.D. candidates only.

Credit, 1-4. Staff.

802. ADVANCED DAIRY CHEMISTRY.

The physical, colloidal, and chemical properties of dairy products and the role of milk fat, salts, proteins, carbohydrates and enzyme systems.

Two class hours.

Prerequisite, permission of instructor.

Credit, 3. Mr. Potter.

**809. MICROBIOLOGY AND
FOOD PROCESSING.**

Relationship of yeasts, molds, and bacteria to foods. Invasion of plant tissue by microorganisms. Microbiology of frozen and refrigerated foods. Ionizing radiation preservation. Alcohol and lactic acid fermentations and vinegar production.

Two class hours, one 3-hour laboratory period.

Prerequisites, food processing, basic biochemistry and microbiology, and permission of instructor.

Credit, 3. Mr. Levin.

**810. THERMOBACTERIOLOGY
AND FOOD PROCESSING.**

Bacteria of importance in spoilage of canned foods. Bacterial contamination and its control. Thermal resistance of bacteria. Heat transfer in thermally processed foods. Calculation and evaluation of sterilization processes.

Prerequisites, FS&T 809 and calculus.

Credit, 3. Mr. Stumbo.

816. FOOD PACKAGING.

Characteristics of packaging materials and how they meet the package requirements of various food products. Methods of testing for structural quality and performance including moisture and gas transmission. Evaluation and case studies of current food packages and products. Plant visits in non-scheduled hours. One or more class hours, one 4-hour laboratory period.

Prerequisite, FS&T 661.

Credit, 3. Mr. Hayes.

821. LIPID CHEMISTRY.

Composition and chemical properties of edible fats and oils. Physical characteristics—plasticity, polymorphism, melting, solidification. Technology of industrial fats—extraction, refining, hydrogenation, interesterification. Deteriorative reactions—oxidation, thermal degradation. Biological significance. New methods of analysis. Review of current literature.

Two class hours, one 2-hour laboratory period.

Prerequisite, permission of instructor.

Credit, 3. Mr. Nawar.

841. ADVANCED FOOD ANALYSIS.

Instrumental methods. Infrared spectroscopy, gas chromatography and mass spectrometry. Theory, techniques and applications.

Two class hours, one 2-hour laboratory period.

Prerequisites, FS&T 672 and 684.

Credit, 3. Mr. Fagerson.

**850. COLORIMETRY AND
APPEARANCE.**

Color theory encompassing the physics and psychophysics of color matching and measurement along with the physiology of vision. Development of color solids and scales. Interpretation of reflection and transmission data in terms of Munsell, C.I.E., Hunter, MacAdam and other color solids, color tolerances and color differences. Visual and instrumental characterization of color and appearance.

Total of 20 lecture hours and 12 laboratory hours.

Prerequisite, permission of instructor.

Not open to FS&T majors.

Credit, 2. Mr. Francis, Mr. Clydesdale.

Two class hours, one 3-hour laboratory period.

Prerequisite, permission of instructor.

The extra lectures and laboratory classes will be devoted to color and quality changes with emphasis on foods.

Credit, 3. Mr. Francis, Mr. Clydesdale.

860. PIGMENTS IN FOODS.

Chemistry, analysis and processing implications of the anthocyanins, flavonoids, chlorophylls, carotenoids, betacyanins, meat pigments, and nonenzymatic browning systems. Heavily weighted on chemistry but also includes interpretations in terms of appearance, nutritive value and general quality. Designed to complement FS&T 850. Two class hours, one 3-hour laboratory period.

Prerequisite, permission of instructor.

Credit, 3. Mr. Clydesdale, Mr. Francis.

871, 872. SEMINAR.

Review of current literature and research. Visiting lecturers. One class hour. Maximum credit, 6.

Credit, 1. Staff.

895. BIOLOGICAL AND TOXICOLOGICAL ASSAY OF FOODS.

Laboratory training in making biological assays of good constituents important in human and animal nutrition. Added chemicals in foods. *Credit, 2-5. Mr. Sawyer.*

800. MASTER'S THESIS. *Credit, 10.*

900. DOCTORAL DISSERTATION. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

558. ANIMAL PRODUCTS.

Preparation, processing, packaging and marketing of animal products.

One class hour, one 4-hour laboratory period. *Credit, 3. Mr. Buck, Mr. Denison.*

652. FOOD CHEMISTRY.

The chemistry of food products. Chemical and biological changes that occur in foods during storage and processing. Emphasis on changes at the cellular and molecular levels. Prerequisite, biochemistry or concurrent registration.

Two class hours, one 4-hour laboratory period alternate weeks.

Credit, 3. Mr. Hultin.

661. FOOD PROCESSING.

Introduction to the food industry, principles of processing and preservation in current usage. Statistical quality control procedures. Three class hours, laboratories by arrangement.

Credit, 3. Mr. Mulvaney.

662. FOOD PROCESSING LABORATORY.

Application and utilization of pilot plant equipment to study and evaluate principles of commercial practice in the food industry. Introduction to advanced techniques of food processing.

One class hour, one 4-hour laboratory period.

Prerequisite, FS&T 661.

Credit, 3. Mr. Mulvaney.

665. UNIT OPERATIONS.

Technical principles involved in the han-

dling and processing of milk and dairy products.

Two class hours, one 2-hour laboratory period. *Credit, 3. Mr. Hankinson.*

666. QUALITY CONTROL AND STANDARDS.

Relationship of composition, handling, processing, storage and market regulations to the bacteriological and chemical quality of milk and its products.

Two class hours, two 2-hour laboratory periods. *Credit, 4. Mr. Evans.*

671. ANALYSIS OF FOOD PRODUCTS.

Physical, chemical, microbiological and microscopical methods.

Two class hours, one 4-hour laboratory period.

Prerequisite, Analytical Chemistry.

Credit, 3. Mr. Hunting.

672. OBJECTIVE ANALYTICAL METHODS AND INSTRUMENTATION.

Continuance of 671.

Two class hours, one 4-hour laboratory period.

Prerequisite, FS&T 671.

Credit, 3. Mr. Hunting.

684. SENSORY EVALUATION METHODS.

An introduction to sensory measurements in the evaluation and acceptance of foods. Panel tests and their statistical interpretation; taste, odor, color, and texture measurements.

One class hour, one 2-hour laboratory period. *Credit, 2. Mr. Sawyer.*

COURSES NOT FOR MAJOR CREDIT

(No graduate credit for students majoring in Food Science and Technology.)

551. INTRODUCTORY FOOD SCIENCE.

Primarily for department majors. Covers food manufacture, processing, distribution and spoilage problems.

Credit, 3. Mr. Hayes.

575. SURVEY OF FOOD
TECHNOLOGY.

A survey of the field. Not open to department majors.

Two class hours, one 2-hour laboratory period.

Credit, 3. Mr. Esselen, Mr. Hayes.

Forestry and Wood Technology

GRADUATE FACULTY

Arnold D. Rhodes, *Head of the Department and Professor of Forestry*, B.S., New Hampshire, 1934; M.F., Yale, 1937.

Herschel G. Abbott, *Professor of Forestry*, B.S., Maine, 1943; M.F., Harvard, 1952; M.A., 1959.

Robert S. Bond, *Associate Professor of Forestry*, B.S., Massachusetts, 1951; M.F., Yale, 1952; Ph.D., State University of N.Y., College of Forestry, 1966.

Carl A. Carlozzi, *Associate Professor of Resource Planning*, B.S., Kent State, 1955; M.A., 1957; Ph.D., Michigan, 1965.

Harold B. Gatslick, *Professor of Wood Technology*, B.S., State University of N.Y., College of Forestry, 1944; M.S., 1948; Ph.D., 1954.

R. Bruce Hoadley, *Associate Professor of Wood Technology*, B.S., Connecticut, 1955; M.F., Yale, 1957; D.F., 1962.

William P. MacConnell, *Professor of Forestry*, B.S., Massachusetts, 1943; M.F., Yale, 1948.

Donald L. Mader, *Professor of Forestry*, B.S., State University of N.Y., College of Forestry, 1950; M.S., Wisconsin, 1954; Ph.D., 1956.

Joseph C. Mawson, *Assistant Professor of Forestry*, B.S., Maine, 1956; M.F., Duke, 1958; M.A., California at Berkeley, 1966.

William S. McNamara, *Assistant Professor of Wood Technology*, B.S., Massachusetts, 1962; M.S., Idaho, 1964; Ph.D., North Carolina State, 1968.

John H. Noyes, *Professor of Forestry*, B.S., Connecticut, 1937; M.F., Yale, 1939.

William W. Rice, *Associate Professor of Wood Technology*, B.S., University of Maine, 1948; M.F., Yale, 1949; D.F., Duke, 1964.

Brayton F. Wilson, *Assistant Professor of Forestry*, A.B., Harvard, 1955; M.F., 1957; Ph.D., California at Berkeley, 1961.

Degrees offered are the Master of Science and Doctor of Philosophy. Areas of program emphasis may include forest soils and ecology, physiology, silviculture, forest management, resource economics and planning, forest recreation, watershed management, wood and fiber product marketing, wood science and technology including drying, machining, adhesives and coating. Because of the interdisciplinary nature of these subjects, programs of study, especially at the doctoral level, usually draw heavily upon courses in other departments. A reading knowledge of one or more foreign languages sufficient to understand journal material may be required of doctoral students depending upon the area of specialization.

An applicant's undergraduate preparation preferably should have concentrated in forestry, wood science and technology, engineering, or a closely related field of natural resource management, conservation, natural science, social science, or economics. Students with other backgrounds can be accommodated but longer-than-typical programs will be required to qualify for a degree. Doctoral candidates need not necessarily obtain a Master's degree en route to the doctorate.

FORESTRY

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROJECT.

Selected research problem in forestry not related to the candidate's thesis.

Credit, 2-4. Staff.

701. ADVANCED FOREST SOILS.

The relation of soils to tree growth and

other environmental factors with emphasis on research methods, site evaluation, water relationships, and fertility; laboratory and field exercises.

Prerequisite, For 524 or equivalent.

Credit, 3. Mr. Mader.

702. AERIAL PHOTO- INTERPRETATION.

Advanced aerial photo-interpretation emphasizing the analysis of natural vegetation, especially forest vegetation; a wide selection of aerial photographs is available for interpretive study and cartography.

Prerequisite, For 531 or equivalent.

Credit, 3. Mr. MacConnell.

703. ADVANCED FOREST ECOLOGY.

Research methods and instrumentation in forest ecology; forest influences with emphasis on the effect of micro-climate on site quality and the management of watersheds.

Prerequisite, For 523 or equivalent.

Credit, 3. Mr. Mader.

704. ADVANCED SILVICULTURE.

Growth and reproductive characteristics and requirements of trees and forest stands as they affect silvicultural management, particularly in relation to thinning and the establishment of forest regeneration.

Prerequisites, For 523, 524 and 526 or equivalents.

Credit, 3. Mr. Rhodes.

705. RESEARCH CONCEPTS IN FOREST BIOLOGY.

The development of biological knowledge relating to forestry from both the historical and philosophical points of view with emphasis on contributions of contemporaneous scientific research. Given in alternate years.

Credit, 3. Mr. Abbott.

706. ADVANCED FOREST MENSURATION.

Regression analysis applied to stand and tree volume determination, stand growth and yield, forest site evaluation, and related measurement problems. Computer techniques will be used to solve some of the problems.

Prerequisites, For 525 and 534 or equivalents.

Credit, 3. Mr. Mawson.

707. ADVANCED FOREST MANAGEMENT.

Economic evaluation of forest enterprises; appraisal of rates of return, damage, and stumpage values.

Prerequisite, For 540 or equivalent.

Credit, 3. Mr. MacConnell.

708. MICRO-ECONOMICS OF FORESTRY I.

Principles of micro-economics as applied to forestry problems with emphasis on marginal analysis in regard to land, labor, and capital.

Prerequisite, For 535 or equivalent.

Credit, 3. Mr. Bond.

709. MICRO-ECONOMICS OF FORESTRY II.

A continuation of Forestry 708 with emphasis on supply and demand, marketing, taxation, and social problems in relation to the forest economy.

Credit, 3. Mr. Bond.

791, 792. SEMINAR.

Specialized study in a selected area of forestry.

Credit, 1-3. Staff.

800. MASTER'S THESIS. *Credit, 6-10.*

900. DOCTORAL DISSERTATION.

Credit, 30.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS (For either major or minor credit)

522. CONSERVATION OF NATURAL RESOURCES.

Conservation principles and their application to problems in soil, water, forests, wildlife, mineral, and general landscape resources; relationship of conservation to national development.

Credit, 3. Mr. Carlozzi.

523. SILVICS.

Forest ecology as a foundation for silviculture; environmental factors and their effect upon vegetation; development and classification of trees and forest communities; forest influences.

Credit, 4. Mr. Mader, Mr. Wilson.

524. FOREST SOILS.

Effects of soil properties on tree growth; relationship of soils to silviculture, harvesting, watersheds, wildlife, and range management; forest soil description, classification and mapping.

Credit, 3. Mr. Mader.

525. THE ELEMENTS OF
FOREST MENSURATION.

The measurement of trees, stands, and forest products; field and office practice in timber estimating and log scaling; collection and compilation of forest inventory data.

Credit, 3. Mr. Mawson.

526. THE PRINCIPLES
OF SILVICULTURE.

Forest culture of wood crops: regeneration and intermediate cuttings, silvicides, prescribed burning, site treatment, slash disposal, nursery management, forest planting and direct seeding; interactions with management for water, wildlife, recreation and aesthetics.

For 523 recommended.

Credit, 4. Mr. Rhodes, Mr. Abbott.

527. TREE PHYSIOLOGY.

Growth and development during the life cycle of trees, emphasizing the whole-plant approach and phenomena best studied in trees; the physiological basis of silviculture. Prerequisite, Botany 211 or equivalent.

Credit, 3. Mr. Wilson.

529. FOREST PROTECTION.

Principles of protecting forests from fire, insects, diseases, domestic animals, wildlife, and atmospheric agencies with emphasis on the prevention and control of forest fires.

Credit, 3. Mr. Abbott.

531. AERIAL PHOTOGRAMMETRY.

Principles of photogrammetry in forest management, wildlife biology, and other fields concerned with large land surfaces. Photographic interpretation and map making from aerial photographs.

Credit, 3. Mr. MacConnell.

532. FOREST TREE IMPROVEMENT.

Tree introduction, geographic variation, tree selection, vegetative propagation, con-

trolled pollination and hybridization, seed orchard management.

Credit, 3. Mr. Abbott.

534. FOREST SURVEY AND
SAMPLING DESIGN.

The theory and application of sampling techniques in forest survey and research problems including simple random, stratified, sub-sampling, representative, and probability sampling.

Credit, 3. Mr. Mawson.

535. FORESTRY ECONOMICS.

The application of economic principles to the allocation of land, labor and capital in forest enterprises; market and pricing theory of forest products.

Prerequisite, Introductory Economics.

Credit, 3. Mr. Bond.

536. FOREST RESOURCES
POLICY.

Forest policy in the United States; history of policy development; factors affecting forest resources management; forest taxation, credit, insurance, and resource planning.

Credit, 3. Mr. Bond.

540. PRINCIPLES OF
FOREST MANAGEMENT.

Multiple-use management of forest land, organization of the forest for sustained-yield management; preparation of a management plan for a 10,000-acre forest. Laboratory period optional for non-forestry majors.

Prerequisite for the laboratory, For 525.

Credit, 3 or 5. Mr. MacConnell.

602. ECOLOGICAL PRINCIPLES IN
RESOURCE PLANNING.

Analysis of ecological principles and their relationship and importance to resource planning. State and Federal conservation programs chosen for critical case study.

Prerequisite, permission of instructor.

Credit, 3. Mr. Carlozzi.

WOOD TECHNOLOGY
COURSES OPEN TO
GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROJECT.

Selected research problem in wood tech-

nology not related to the candidate's thesis.
Credit, 2-4. Staff.

710. CHEMICAL MODIFICATION OF WOOD.

Basic concepts and techniques concerning the chemical modification of wood; the potential and limitations of physical and chemical treatments as they affect the dimensional stability and durability of wood.

Prerequisites, Organic Chemistry and Wood Tech 504.
Credit, 3. Mr. Gatslick.

711. POLYSACCHARIDE AND LIGNIN CHEMISTRY.

The chemistry and biochemistry of lignin, and of plant polysaccharides with special reference to gums, pectins, hemicelluloses, and cellulose.

Prerequisites, Organic Chemistry, Wood Tech 538 or equivalent.
Credit, 3. Mr. McNamara.

791, 792. SEMINAR.

Specialized study in a selected segment of wood products marketing or wood technology.
Credit, 1-3 each semester. Staff.

800. MASTER'S THESIS. *Credit, 6-10.*

900. DOCTORAL DISSERTATION. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS (For either major or minor credit)

501. WOOD ANATOMY AND IDENTIFICATION.

A basic anatomical study of wood elements, their structural characteristics and function; identification of woods.

Credit, 3. Mr. Hoadley.

502. PRIMARY TIMBER CONVERSION (1972-73).

Survey of operations, principally sawmilling, in primary conversion of logs into lumber and allied by-products; drying, grading, handling and market distribution of sawmill products. Not open to students in forest management except by special permission.

Credit, 3. Mr. Rice.

503. FOREST PRODUCTS.

A survey of the principal forest products, their manufacture and distribution.

Credit, 3. Mr. Gatslick.

504. PROPERTIES OF WOOD (1972-73).

The physical and chemical characteristics of wood in relation to its use; the influence of growth upon wood properties; methods of testing.

Credit, 3. Mr. Hoadley.

506. WOOD MACHINING TECHNOLOGY (1971-72).

Fundamental principles of knife and sawtooth action as applied to problems of severing, surfacing, and shaping; general survey of commercial wood machining equipment.

Prerequisites, Wood Tech 501 and 504.

Credit, 3. Mr. Rice.

508. WOOD SEASONING AND PRESERVATION (1972-73).

Properties of wood in relation to drying and preservation; theory and practice of air seasoning, kiln drying, and preservative treatment.

Credit, 3. Mr. Rice.

511. WOOD ADHESIVE TECH- NOLOGY (1972-73).

Basic concepts, theories, and the applied techniques of gluing wood and fibrous composites.

Prerequisites, Wood Tech 501 and 502, Chem 160 or permission of instructor.

Credit, 3. Mr. McNamara.

512. WOOD COATING TECH- NOLOGY (1971-72).

Basic concepts and applied techniques in wood substrate surface modification including materials and methods for finishing wood and fibrous composites.

Prerequisites, Wood Tech 501 and 502, Chem 160 or permission of instructor.

Credit, 3. Mr. Gatslick.

538. WOOD CHEMISTRY (1971-72).

Introduction to the chemistry and surface phenomena of the principal products found in wood.

Prerequisite, Organic Chemistry.

Credit, 3. Mr. McNamara.

French

GRADUATE FACULTY

Robert E. Taylor, *Director of Graduate French Studies, Head of the Department of French and Professor of French*, B.A., Reed College, 1943; M.A., Columbia, 1947; Ph.D., 1951.

Marie-Rose Carré, *Associate Professor of French*, B.-ès-L., Alger, 1938; L.-ès-L., 1940; Agrég. des L., 1941; Doct. de l'Un. Paris, 1963.

Thomas Cassirer, *Associate Professor of French*, B.A., McGill, 1945; Ph.D., Yale, 1953.

Micheline Dufau, *Professor of French*, B.-és-L., Paris, 1945; B.S., New York University, 1951; Ph.D., 1960.

Christian Garaud, *Assistant Professor of French*, B.-ès-L., Poitiers, 1954; L.-ès-L., 1958; Doc. de 3^e cycle, 1961 (in Classics); Doc. de 3^e cycle, 1969 (in French).

Robert J. Goar, *Assistant Professor of Romance Languages (Classics)*, A.B., Harvard College, 1954; M.A., Harvard University, 1958; Ph.D., 1968.

Stowell C. Goding, *Professor of French*, B.A., Dartmouth, 1925; M.A., Harvard, 1936; Ph.D., Wisconsin, 1942.

Agnes G. Raymond (Howard), *Associate Professor of French*, B.A., Wilson College, 1937; M.A., Syracuse, 1945; D.M.L., Middlebury College, 1956.

Patricia J. Johnson, *Associate Professor of French*, B.A., Minnesota, 1953; M.A., 1956; Ph.D., 1960.

Robert B. Johnson, *Professor of Romance Languages*, B.A., Ohio University, 1940; M.A., Wisconsin, 1946; Ph.D., 1949.

Gilbert W. Lawall, *Associate Head for Classics (Dept. of French) and Associate Professor of Romance Languages (Classics)*, B.A., Oberlin College, 1957; Ph.D., Yale, 1961.

Sarah N. Lawall, *Associate Professor of French*, B.A., Oberlin, 1956; Ph.D., Yale, 1961.

Paul A. Mankin, *Associate Professor of Romance Languages*, B.A., California at

Los Angeles, 1948; M.A., 1953; Ph.D., Yale, 1959.

Anne Amory Parry, *Associate Professor of Romance Languages (Classics)*, B.A., Vassar, 1952; M.A., Radcliffe, 1955; Ph.D., 1957.

Edward Phinney, Jr., *Associate Professor of Romance Languages Classics*, B.A., University of Oregon, 1957; M.A., 1959; Ph.D., California at Berkeley, 1963.

Benjamin Rountree, *Associate Professor of French*, B.A., Georgia, 1953; M.A., 1955; Ph.D., Yale, 1960.

Harold L. Smith, Jr., *Associate Professor of French*, B.-ès-L., Paris, 1940; B.A., Swarthmore, 1947; M.A., Columbia, 1950; Ph.D., Wisconsin, 1955.

Sara Sturm, *Assistant Professor of French and Italian*, B.A., Minnesota, 1963; M.A., 1965; Ph.D., North Carolina, 1967.

Zina Tillona, *Associate Head for Italian*, Associate Professor of Italian, B.A., Hunter, 1950; M.A., Wellesley, 1951; D.M.L., Middlebury, 1960.

Seymour S. Weiner, *Professor of French*, B.A., City College of New York, 1940; M.A., California at Berkeley, 1941; Ph.D., Columbia, 1950.

ASSOCIATED FIVE-COLLEGE GRADUATE FACULTY

William S. Bell, *Associate Professor of French*, (Mount Holyoke College), A.B., Howard, 1942; B.M., Birmingham Conservatory of Music, 1948; M.A., Middlebury, 1949; Ph.D., Columbia, 1960.

Jeffrey J. Carre, *Professor of Romance Languages*, (Amherst College), B.A., Bowdoin, 1940; M.A., Columbia, 1941; Ph.D., 1951.

Reginald F. French, *Professor of Romance Languages*, (Amherst College), B.A., Dartmouth, 1927; M.A., 1928; Ph.D., Harvard, 1934.

Paul F. Saintonge, *Professor of French*, (Mount Holyoke College), A.B., Harvard, 1924; A.M., 1927; Ph.D., 1930.

Margaret L. Switten, *Associate Professor of French*, (Mount Holyoke College), B.M., Westminster Choir College, 1947;

B.A., Barnard, 1948; M.A., Bryn Mawr, 1949.

Course requirements for the M.A.:

1. French 705 (Bibliography and Methods), or an equivalent course.
2. French 800 may be elected for not more than nine credits.
3. Terminal examinations as follows:
 - a. Comprehensive examination.
 - b. For those electing French 800, oral defense of thesis. Students are advised to elect French 710 (Romance Philology and the History of the French Language). All courses offered by the Department are taught in French.

*THE FIVE-COLLEGE COOPERATIVE
Ph.D. IN FRENCH*

The University requirements for admission to the Graduate School require "acceptance by the department." For the Cooperative Ph.D. in French, acceptance is by all four departments.

In addition to the general requirements for the degree at the University, the following special requirements must be met:

1. Required courses:
 - a. One semester of Romance Philology or its equivalent.
 - b. One semester of Old French or its equivalent.
 - c. French 705 (Bibliography and Methods), or the equivalent knowledge.
 - d. French 900, Doctoral Dissertation.
2. A reading knowledge at an intermediate or advanced level as determined by the department of a second Romance Language and of German or another major language other than English pertinent to the student's program.
3. The ability to teach French.
4. Candidates planning to write a thesis in the Medieval or Renaissance field must have a reading knowledge of Latin.
5. An oral examination as part of the preliminary comprehensive examination, demonstrating proficiency in the language itself, a knowledge of the whole body of

French literature and of the history of the language, a thorough knowledge of the candidate's special field, evidence of knowledge of the history and the culture of the country or countries involved.

**COURSES OPEN TO GRADUATE
STUDENTS ONLY**

(For either major or minor credit)

409. GRADUATE READING COURSE.

Designed for graduate students preparing for their M.A. or Ph.D. reading examination. No previous knowledge of French required.
No credit. Staff.

700. PROBLEM COURSE.

Directed study in some phase of linguistics or literature.
Credit, 3-12. Staff.

**705. BIBLIOGRAPHY AND
METHODS OF LITERARY
RESEARCH.**

(Required of candidates for the degrees of Master of Arts and Ph.D.)

Credit, 3. Mr. Taylor, Mr. Weiner.

**710. ROMANCE PHILOLOGY
AND THE HISTORY OF
THE FRENCH LANGUAGE.**

The development of the Romance Languages, particularly French, from Vulgar Latin.
Credit, 3. Mrs. Chen.

711. FRENCH PHILOLOGY.

Credit, 3.

715. OLD FRENCH READINGS.

The monuments of French literature from the earliest times to the XVth Century. Prerequisite, French 710 or equivalent.

Credit, 3. Miss Dufau.

720. THE MEDIEVAL THEATER.

Study of the principal dramatic forms from the Twelfth through the Fifteenth Century.

Credit, 3.

725. THE OLD FRENCH EPIC.

Some of the most outstanding *chansons de geste* and of the development of the cycles of epic poetry.
Credit, 3.

730. THE "ROMAN COURTOIS."

Special emphasis upon Chrétien de Troyes and his successors. *Credit, 3.* Miss Dufau.

740. RABELAIS AND MONTAIGNE.
The changing ideas in the French Renaissance.
Credit, 3.

745. LYRIC POETRY OF THE
RENAISSANCE.
Emphasis upon the Pléiade from the background of the "grands rhétoriciens," Marot, and the "école lyonnaise."
Credit, 3.

750. LIBERTINAGE IN THE
SEVENTEENTH CENTURY.
Aspects of the history of thought from Montaigne to Pierre Bayle.
Credit, 3. Mr. Taylor.

755. LA FONTAINE AND
LYRIC POETRY.
From Malherbe to the *Fables*.
Credit, 3.
760. MOLIERE.
The man and the dramatist; his ideas and his techniques.
Credit, 3. Mr. Taylor, Mr. Rountree.

765. RACINE.
A detailed analysis of the major and minor plays as drama and as poetry.
Credit, 3. Mr. Rountree, Mrs. Carré.
770. VOLTAIRE AND HIS TIMES.
Credit, 3. Mr. Taylor.

755. DIDEROT.
The original thinker and compiler.
Credit, 3. Mr. Taylor.

780. MONTESQUIEU AND HIS
TIMES. *Credit, 3. Mrs. Raymond.*

790, 791. THE CRAFT OF FICTION
IN THE FRENCH NOVEL.
The exploration of different modes in the treatment of realism through a study of the craft of fiction of individual novelists, with emphasis upon the level of the XIXth Century.
Credit, 3 each semester. Mr. Smith.

799. SEMINAR IN FRENCH
LANGUAGE OR LITERATURE.
Subjects announced in advance. Students admitted with departmental approval.
Credit, 3-12.

805. FLAUBERT AND ZOLA.
The assimilation of the "mouvement des idées" of the period within the fictional worlds of the two novelists.
Credit, 3. Mr. Smith.

810. BALZAC AND STENDHAL.
Credit, 3. Mr. Weiner.

815. BAUDELAIRE AND
THE SYMBOLISTS.
Emphasis on the aesthetics and poetics of Baudelaire alone, his work serving as an introduction to the gamut of symbolist poetry.
Credit, 3. Mr. Johnson.

820. THE CRITICS OF THE
NINETEENTH CENTURY.
Development of criticism from Sainte-Beuve.
Credit, 3. Mr. Weiner.

821. MODERN LITERARY
CRITICISM.
Critical tenets and practices in the Twentieth Century. Readings and discussions of, for example, Thibaudet, Bachelard, Paulhan, Sartre.
Credit, 3. Mr. Weiner.

825. THE ANTI-NOVEL AND
ANTI-THEATER.
The reaction against established literary form and convention in the novels of such authors as Sarraute, Robbe-Grillet, Butor, and Simon, and in the plays of such authors as Ionesco and Adamov.
Credit, 3. Mrs. Johnson.

830. CLAUDEL AND GIRAUDOUX.
Aesthetic and moral values.
Credit, 3. Mr. Mankin.

835. SARTRE AND CAMUS.
The novels, short stories, plays, and philosophical essays.
Credit, 3. Mrs. Johnson.

840. PROUST AND GIDE. *Credit, 3.*

800. MASTER'S THESIS.
Maximum Credit, 9.
900. DOCTORAL DISSERTATION.
Credit, 30.

COURSES OPEN TO BOTH
GRADUATE AND UNDER-
GRADUATE STUDENTS
(For either major or minor credit)
600. COURS DE STYLE.
Syntax and Idiom at an advanced level.
Credit, 2 each semester. Mr. Smith.
610. FRENCH CIVILIZATION.
Those elements which underlie the cultural

contribution of France to world civilization. Assigned reading drawn from contemporary French literature. *Credit, 3.*

620. THE FRENCH RENAISSANCE.

The major writers of the Sixteenth Century with appropriate attention to important humanistic and artistic developments.

Credit, 3. Miss Azibert.

621. LANGUAGE STUDY.

Teaching methods. Recommended for those intending to teach French in high schools or elementary schools.

Credit, 3. Mr. Berwald.

625. FRENCH LITERATURE OF THE SEVENTEENTH CENTURY.

Emphasis on the prose writers and non-dramatic forms. *Credit, 3. Mr. Cassirer.*

630. FRENCH LITERATURE OF THE SEVENTEENTH CENTURY.

Emphasis on the theater.

Credit, 3. Mr. Rountree.

640. FRENCH LITERATURE OF THE EIGHTEENTH CENTURY.

The chief writers and thinkers of the Age of Enlightenment. *Credit, 3. Mr. Taylor.*

645. THE DRAMA OF THE FRENCH ENLIGHTENMENT.

Readings in the French theater from LeSage to Beaumarchais.

Credit, 3. Mrs. Raymond.

655. FRENCH NOVEL OF THE NINETEENTH CENTURY.

The development of the novel since the revolution. *Credit, 3.*

656. FRENCH THEATER OF THE NINETEENTH CENTURY.

The development of the theater from Hugo to Rostand and his contemporaries.

Credit, 3.

657. FRENCH POETRY OF EARLY NINETEENTH CENTURY.

The major movements in poetry up to Baudelaire and the Symbolists. *Credit, 3.*

660. FRENCH THEATER OF THE TWENTIETH CENTURY.

The modern French theater from Scribe to the present. *Credit, 3. Staff.*

665, 666. MAJOR FIGURES OF THE CONTEMPORARY FRENCH NOVEL.

The novel of social concern, the novel of personal and aesthetic concern, and the novel concerned with the human condition.

Credit, 3 each semester.

Mrs. Johnson.

675, 676. CONTEMPORARY FRENCH POETRY.

French verse from Nerval to the present.

Credit, 3 each semester.

Mr. Johnson, Mrs. Lawall.

RELATED COURSES:

Comparative Literature:

631. THE ENLIGHTENMENT.

641. ROMANTICISM.

642. FROM IDEALISM TO REALISM.

651. SYMBOLISM.

652. MODERN DRAMA.

661. THE CONTEMPORARY EUROPEAN NOVEL.

675. ANGLO-GERMAN LITERARY RELATIONSHIPS.

Descriptions of these courses appear under "Comparative Literature Program," p. 105.

Geology

GRADUATE FACULTY

Joseph H. Hartshorn, *Head of the Department and Professor of Geology*, S.B., Harvard, 1947; M.A., 1950; Ph.D., 1955.

R.W. Bromery, *Professor of Geophysics*, B.S., Howard, 1956; M.S., American University, 1962; Ph.D., Johns Hopkins, 1968.

Oswald C. Farquhar, *Professor of Geology*, B.A., Oxford, 1947; M.A., 1948; Ph.D., Aberdeen, 1951.

Stephen E. Haggerty, *Assistant Professor of Geology*, B.Sc., London University, Imperial College of Science and Technology, 1964; Ph.D., 1968.

Leo M. Hall, *Associate Professor of Geology*, B.S., St. Lawrence, 1954; M.S., Cincinnati, 1956; Ph.D., Harvard, 1959.

Miles O. Hayes, *Associate Professor of Geology*, A.B., Berea College, 1957; M.A., Washington University, 1959; Ph.D., Texas, 1965.

John F. Hubert, *Professor of Geology*, A.B., Harvard, 1952; M.S., Colorado, 1954; Ph.D., Pennsylvania State University, 1958.

Howard W. Jaffe, *Professor of Geology*, B.A., Brooklyn College, 1942.

George E. McGill, *Associate Professor of Geology*, B.A., Carleton College, 1953; M.S., Minnesota, 1955; Ph.D., Princeton, 1958.

Stearns A. Morse, *Associate Professor of Geology*, A.B., Dartmouth, 1952; M.S., McGill, 1958; Ph.D., 1962.

Ward S. Motts, *Associate Professor of Geology*, B.A., Columbia, 1949; M.S., Minnesota, 1951; Ph.D., Illinois, 1957.

Charles W. Pitrat, *Associate Professor of Geology*, B.A., Kansas, 1949; M.S., Wisconsin, 1951; Ph.D., 1953.

Peter Robinson, *Associate Professor of Geology*, A.B., Dartmouth, 1954; M.Sc., Otago University, New Zealand, 1958; Ph.D., Harvard, 1964.

H. T. U. Smith, *Professor of Geology*, B.S., Wooster College, 1930; M.A., Harvard, 1933; Ph.D., 1936.

Gregory W. Webb, *Associate Professor of Geology*, B.A., Columbia, 1948; M.A., 1950; Ph.D., 1954.

Donald U. Wise, *Professor of Geology*, B.S., Franklin and Marshall College, 1953; M.S., California Institute of Technology, 1955; Ph.D., Princeton, 1957.

ASSOCIATED FIVE-COLLEGE GRADUATE FACULTY

Gerald P. Brophy, *Professor of Geology*, (Amherst College), A.B., Columbia, 1951; M.A., 1953; Ph.D., 1954.

H. Robert Burger, III, *Assistant Professor of Geology*, (Smith College), B.S., Yale, 1962; A.M., Indiana University, 1964; Ph.D., 1966.

Richard M. Foose, *Professor of Geology*, (Amherst College), B.S., Franklin and Marshall, 1937; M.S., Northwestern, 1939; Ph.D., Johns Hopkins, 1942.

Marshall Schalk, *Associate Professor of Geology and Geography*, (Smith College), A.B., Harvard, 1929; A.M., 1931; Ph.D., 1936.

Requirements for the M.S. degree are as follows:

1. A minimum of 60 credits in geology, including both undergraduate and graduate work.
2. Courses in related sciences comparable to those required for undergraduate majors: one year each of chemistry and physics, and mathematics through calculus.
3. Proficiency in technical writing.
4. At least six weeks of training in field geology.
5. A basic knowledge of mineralogy (including elementary geochemistry), paleontology, petrology, structural geology (including elementary geophysics), sedimentology, stratigraphy, geomorphology, one applied field of geology (e.g., petroleum geology, economic geology of metals, etc), and regional geology. This requirement will be met by passing an examination on these subjects at the beginning of the first semester in residence or by passing the appropriate courses at the University of Massachusetts with a minimum grade of B.
6. A thesis based at least in part on field study, and representing an original contribution to geologic knowledge. The field restriction may be waived by vote of the graduate faculty for students interested in special problems (e.g., extraterrestrial geology).

Requirements for the Ph.D. degree:

Ordinarily the doctoral candidate is assumed to have received the Master's degree or equivalent training; selected

students with outstanding records may proceed more directly toward meeting doctoral requirements.

Candidates must fulfill the general Graduate School requirements in addition to:

1. Basic training in physics, chemistry, and mathematics and additional work in at least one of these fields.
2. At least six weeks of training in field geology, to be followed by at least four months of approved field experience.
3. A broad knowledge of fundamental concepts, methods of investigation, and historical development of geologic science.
4. Reading knowledge of two foreign languages sufficient to understand journal material.
5. Mastery of an elected field or fields of specialization.
6. A thesis representing an original contribution to geologic knowledge.
7. A final examination in defense of the thesis.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

*Satisfies requirement for technical writing proficiency.

700. SPECIAL PROBLEMS.

Either or both of the following options may be selected:

A. Independent study—guided reading and/or laboratory study in subjects or techniques not covered by other courses in the department.

B. Research—original library, field, and/or laboratory investigation of a selected problem.

Prerequisites, 45 credits in geology and permission of department head and instructor.

Credit, 2–6. Staff.

712. (I) ADVANCED MINERALOGY.

Crystal chemistry, structure, and composition of minerals; interpretation, evaluation, and calculation of mineralogical data; precise measurement of mineralogical constants

by optical microscopy, x-ray diffraction, and other methods.

Prerequisite, Geol 611 or permission of instructor.

Credit, 3. Mr. Jaffe.

713. CLAY MINERALOGY.

Structure of clay minerals, identification, weathering, and alteration of minerals, properties of clay surfaces, geotechnical studies of clays in geology, soil science, and soil mechanics.

Prerequisite, permission of instructor.

Credit, 3.

*716. (II) GEOCHEMISTRY.

Abundance relations and principles governing the distribution, behavior, and migration of the elements and nuclides in the geochemical spheres of the earth, in meteorites, and in the universe.

Prerequisites, Geol 192 and 520 and one year of college chemistry, or permission of instructor.

Credit, 3. Mr. Jaffe.

*722. (I) IGNEOUS PETROLOGY.

Introduction to phase equilibrium in mineral systems, with emphasis on liquidus relationships. Review of theoretical and experimental data and of natural occurrences and their bearing on problems of rock genesis.

Prerequisite, Geol 621, or permission of instructor.

Credit, 3. Mr. Morse.

723. (II) SEDIMENTARY PETROLOGY.

Analysis and origin of primary sedimentary structures; petrography of sandstones; heavy-mineral analysis and interpretation. Field applications emphasized.

Prerequisites, Geol 550 and 611.

Credit, 3. Mr. Hubert.

*724. (I) METAMORPHIC PETROLOGY.

Introduction to phase equilibrium in mineral systems with emphasis on metamorphic reactions. Review of theoretical and experimental data and of natural occurrence and their bearing on metamorphic processes and on the mapping of metamorphic mineral facies.

Prerequisite, Geol 621, or permission of instructor.

Credit, 3. Mr. Robinson.

731. (I) STRUCTURAL GEOLOGY
OF METAMORPHIC ROCKS.

Analysis of the geometry of intensely deformed rocks with emphasis on interpretation of structural features in the field.

Prerequisites, Geol. 531 or equivalent.

Credit, 3. Mr. Hall.

732. (II) ADVANCED STRUCTURAL
GEOLOGY.

Dynamics and mechanics of rock deformation, including theoretical and experimental studies, with field applications.

Prerequisites, Geol 531 and calculus.

Credit, 3. Mr. McGill.

*735. (II) REGIONAL GEOLOGY
OF NORTH AMERICA.

Tectonic concepts as exemplified by the stratigraphic and structural evolution of North America.

Prerequisite, Geol 530.

Credit, 3. Mr. Wise, Mr. McGill.

741. (II) STRATIGRAPHIC
PALEONTOLOGY.

Application of selected fossils and faunal assemblages to stratigraphic correlation, and paleoecological and paleogeographic analysis, with reference to evolutionary trends.

Prerequisites, Geol 540 and 551.

Credit, 3. Mr. Pitrat.

745. (II) PALEOECOLOGY.

Application of ecological principles to the interpretation of fossil animal and plant communities as indicators of depositional environments. Emphasis on marine faunas.

Prerequisites, Geol 540 and 551.

Credit, 2. Mr. Pitrat.

747. (II) PALEO GEOGRAPHIC
ANALYSIS.

Methods of paleogeographic analysis and mapping, including problems in stratigraphic synthesis, basin analysis, and paleogeologic and palinspastic mapping.

Prerequisites, Geol 531, 540 and 550.

Credit, 3. Mr. Webb.

751. (I) SEDIMENTATION.

Analysis of the modes of origin of sedimentary rocks, with special reference to mudrocks, carbonates, and chemical sediments.

Prerequisites, Geol 550 and 611.

Credit, 3. Mr. Hayes.

752. (II) GEOLOGICAL
OCEANOGRAPHY.

Physical characteristics and geological processes of the ocean basins and margins, and their bearing on interpretation of geologic history.

Prerequisites, Geol 550 and 666.

Credit, 3. Mr. Webb.

756. (I) COASTAL PROCESSES.

Sedimentologic and hydrographic processes of coastal environments and their relation to shoreline morphology and sediment transport and deposition. Emphasis on field studies of the estuaries and beaches along the New England shoreline.

Prerequisites, Geol 550 and 660, or permission of instructor. *Credit, 2.* Mr. Hayes.

761. (I) MAP INTERPRETATION.

A laboratory study of the various types of maps used by geologists, with special reference to the identification and interpretation of landforms and structures.

Prerequisites, Geol 530.

Credit, 2. Mr. Smith.

762. (II) ADVANCED
GEOMORPHOLOGY.

A critical study of selected topics and current problems in geomorphology.

Prerequisite, Geol 660.

Credit, 2. Mr. Smith.

769. (I) ADVANCED
PHOTO GEOLOGY.

A laboratory area of selected problems, areas, and techniques, with some emphasis on the use of surface expression as a key to subsurface phenomena.

Prerequisites, Geol 660 and 668.

Credit, 2. Mr. Smith.

771. (I) PHYSICS OF THE EARTH.

Introduction to the physics of the earth as determined from seismological, heat flow, gravity, and paleomagnetic data and their relationship to observed geological phenomena.

Prerequisites, Geol 670 and permission of instructor. *Credit, 3.* Mr. Bromery.

772. (II) ADVANCED GEOPHYSICAL
INTERPRETATION
TECHNIQUES.

Numerical and graphical analyses of air-

borne and ground geophysical surveys, including the use of digital computer programs and geologically meaningful interpretations.

Prerequisites, Geol 670 and permission of instructor. *Credit, 3. Mr. Bromery.*

781. (II) GEOLOGY IN ENGINEERING.

Relation of geologic materials, processes, forms, and techniques to the planning and execution of engineering projects, such as river control, shoreline protection, and construction of highways, bridges, tunnels, dams, etc. Emphasis is on case histories.

Prerequisites, Geol 520, 530, 550, and 660, or permission of instructor; Civ Eng 520 and/or other engineering courses recommended. *Credit, 2. Mr. Farquhar.*

782. (I) PETROLEUM GEOLOGY.

Geologic occurrence of oil and gas. Laboratory work consists of problems related to reservoir and trap conditions and to methods of subsurface study.

Prerequisites, Geol 530 and 550; 735 desirable. *Credit, 3. Mr. Webb.*

783. (I) METALLIFEROUS ECONOMIC GEOLOGY.

Nature, origin, and distribution of metalliferous ores. Criteria for recognition of ore deposits, changes in character of ore with depth, mineral associations, and types of wallrock alteration. Optical and microchemical properties of ore minerals and ore concentrates. Given in alternate years.

Prerequisites, Geol 530 and 520; 722 desirable. *Credit, 3. Mr. Farquhar.*

784. (I) NON-METALLIFEROUS ECONOMIC GEOLOGY.

Geology, distribution, and utilization of non-metallic mineral deposits, including coal and other solid hydrocarbons. Given in alternate years.

Prerequisites, Geol 530, 520, 550 and 611. *Credit, 3. Mr. Farquhar.*

786. (I) HYDROGEOLOGY.

Theoretical and practical hydrogeology: ground-water hydraulics, chemistry of ground water, field methods, relation of ground water to geology, basinal and regional ground-water problems.

Prerequisites, one year of geology; one year of chemistry, and Math 124 or equivalent recommended. *Credit, 3. Mr. Motts.*

790. (I, II) SEMINAR.

Review of current literature or discussion of selected topics. *Credit, 1 each semester. Staff and Students.*

800. MASTER'S THESIS. *Credit, 10.*

805. EVOLUTION OF GEOLOGIC CONCEPTS.

Perspective on current geological thought in the light of its historical background; particular attention to controversial questions and to the rise and decline of ruling theories.

Prerequisite, one year of graduate study. *Credit, 2. Mr. Motts.*

846. (I) CENOZOIC STRATIGRAPHY.

Occurrence, correlation, and origin of marine and terrestrial Cenozoic deposits and their relation to paleogeographic and tectonic conditions, with particular reference to North America.

Prerequisites, Geol 550 and 660; 735 recommended. *Credit, 3. Mr. Webb.*

863. (I) PHYSIOGRAPHY OF NORTH AMERICA.

A survey of the physiographic provinces of North America and their evolution. Emphasis on problems and methods of approach.

Prerequisites, Geol 660 and 735 desirable. *Credit, 3. Mr. Motts.*

887. (II) ADVANCED HYDROGEOLOGY.

Advanced ground-water hydrology, analog models, pumping tests, flow-duration curves, flow nets, Hubbert's hydrologic models, water chemistry, and geophysical methods of investigation.

Prerequisites, Geol 786 and Math 124, or permission of instructor.

Credit, 3. Mr. Motts.

890. (II) SEMINAR IN NORTHERN APPALACHIAN GEOLOGY.

The stratigraphy, structure, petrology, and geophysics of the Northern Appalachians and current research being conducted in the region.

Prerequisites, Geol 531, 550, and 621 or equivalents.

Credit, 1-3. Mr. Hall, Mr. Robinson, Mr. Wise.

891. (I) SEMINAR IN STRUCTURAL GEOLOGY.

Review and discussion of current research in structural geology.

Prerequisites, at least one graduate course in structural geology.

Credit, 1-3. Mr. McGill, Mr. Hall, Mr. Wise, Mr. Robinson.

893. (I, II) SEMINAR IN PLEISTOCENE GEOLOGY.

Directed reading and discussion of current work and publications in glaciology, glacial geology, and related aspects of Quaternary history. Studies of related fields, such as archaeology, early man, geochronology, palynology, plant geography, and paleontology. Prerequisites, permission of instructor.

Credit, 1-3. Mr. Hartshorn.

900. DOCTORAL DISSERTATION.

Credit, 30.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

*Satisfies technical writing requirement.

611. (I) OPTICAL MINERALOGY.

Principles of optics, optical properties of minerals and methods for their measurement, relationship between optical properties and crystallography, and mineral identification by the immersion method.

Prerequisites, Geol 192, Physics 141 and 142.

Credit, 3. Mr. Jaffe, Mr. Hall.

621. (II) PETROGRAPHY.

Identification of minerals in thin section, study of common igneous, sedimentary, and metamorphic rocks in thin section, routine petrographic calculations and measurements, and introduction to petrogenetic theory. Examination of selected igneous and metamorphic rocks in the field.

Prerequisites, Geol 220 and 611.

Credit, 3. Mr. Robinson.

*630. (I) TECTONICS.

Past and present mechanisms creating the broader framework of global geology; mountain-building, ocean-basin structure, continental drift, mantle processes, continental evolution, early history of the earth,

structural geology of selected key regions of the globe.

Prerequisites, Geol 531, 520; undergraduates by permission. *Credit, 3.* Mr. Wise.

*634. (I) ASTROGEOLOGY.

Geology of the solar system with particular emphasis on the solid bodies: age, sequence of events, composition, surficial and internal geologic processes. Photogeologic mapping of selected portions of moon and Mars using recent imagery from the space program.

Prerequisites, Geol 531, 520; undergraduates by permission. *Credit, 3.* Mr. Wise.

651. (I) GEOMETRICS.

Design of geological experiments; the collection and analysis of quantitative data in geology.

Prerequisite, permission of instructor.

Credit, 3. Mr. Hubert.

655. (I) PHYSICAL

OCEANOGRAPHY.

Physical properties of sea water and their variations; water masses and their circulation patterns; interaction between ocean and atmosphere; dynamics of waves, tides, and ocean currents; techniques of oceanographic study.

Prerequisites, two years of college work toward a major in science or engineering; Physics 141 and 142, or 161, 162, and 163; calculus recommended.

Credit, 3. Mr. Hayes.

*660. (I) GEOMORPHOLOGY.

Origin and development of landforms in relation to geological processes, climate, and tectonic history. Application of geomorphic methods to interpretation of geologic history. Two class hours, one 2-hour laboratory period.

Prerequisites, Geol 230 or permission of instructor.

Credit, 3. Mr. Hartshorn.

*666. (II) PLEISTOCENE GEOLOGY.

Geochronology of Pleistocene time as related to climatic changes and their influence on glaciology, erosional and depositional processes, landforms, sedimentary deposits, shifting sea level, and the paleontological record. Field trips by arrangement.

Two class hours, one 2-hour laboratory period.

Prerequisite, permission of instructor.
Credit, 3. Mr. Hartshorn.

668. (II) PHOTO GEOLOGY AND REMOTE SENSING.

Laboratory study of the instruments and methods employed in making measurements and preparing base maps and geologic maps from vertical and oblique aerial photos, together with applications of other remote sensing techniques.

Prerequisite, Geol 531.
Credit, 3. Mr. Smith.

670. (I) GEOPHYSICS.

The physics of the earth and the gravitational, magnetic, electrical, and seismic methods of geophysical exploration. Laboratory problems and computations.

Prerequisites, Geol 230 and 520 or permission of instructor. *Credit, 3.* Mr. Bromery.

COURSES NOT FOR MAJOR CREDIT

(No graduate credit for students majoring in Geology)

520. (II) INTRODUCTORY PETROLOGY.

The classes of rocks with reference to manner of origin, modes of occurrence, structural features and the chemical and petrographic distinction within each group.

Prerequisites, Geol 192.
Two class hours, two 2-hour laboratory periods, and field trips.
Prerequisite, Geol 192.

Credit, 4. Mr. Jaffe.

530. (I) FIELD AND STRUCTURAL GEOLOGY I.

Basic methods of field geology; occurrences and recognition of geologic structure; preparation and interpretation of geologic maps; solution of simple structural problems.

Prerequisite, an introductory geology sequence.

Credit, 3. Mr. McGill,
Mr. Hall, Mr. Wise.

531. (II) FIELD AND STRUC- TURAL GEOLOGY II.

Structural and dynamic analysis of deformed rocks; introduction to tectonics; field study of complex areas.

Prerequisites, Geol 520, 530.

Credit, 3. Mr. Hall,
Mr. Robinson, Mr. Wise.

540. (I) INVERTEBRATE PALEONTOLOGY.

History, development and identification of invertebrate animal fossils. Field trips by arrangement.

Prerequisite, an introductory geology sequence or permission of instructor.

Credit, 3. Mr. Pitrat.

550. (I) SEDIMENTOLOGY.

Processes acting on sediments; composition, origin, and classification of sedimentary rocks.

Prerequisite, Geol 520.

Credit, 3. Mr. Hubert.

551. (II) STRATIGRAPHY AND HISTORICAL GEOLOGY.

Principles of stratigraphic correlation; methods of reconstruction of earth history; tectonic evolution of selected regions.

Prerequisites, Geol 520, 530, 540, and 550, or permission of instructor.

Credit, 3. Mr. Webb.

580. (II) ENGINEERING GEOLOGY.

Materials and surface features of the earth and their relation to engineering problems; map reading as related to the phenomena of physical geology.

Two class hours, one 3-hour laboratory period.

Credit, 3. Mr. Farquhar.

589. (II) FIELD PROBLEMS.

Directed field study and/or research.

One week of full-time summer work for each credit.

Prerequisites, approval of faculty adviser and department head. *Credit, 2-6.* Staff.

Germanic Languages and Literatures

GRADUATE FACULTY

Wolfgang Paulsen, *Head of the Department and Professor of German*, Ph.D., University of Berne, 1934.

E. M. Beekman, *Assistant Professor of German*, B.S., University of California at Berkeley, 1963; Ph.D., Harvard University, 1968.

Jürgen Born, *Associate Professor of German*, B.A., Free University of Berlin, 1953; M.A., Harvard University, 1955; Ph.D., Northwestern University, 1963.

James E. Cathey, *Assistant Professor of German*, B.S., Oregon State University, 1962; M.A., University of Washington, 1964; Ph.D., 1967.

Horst Denkler, *Professor of German*, Ph.D., University of Münster, 1963.

Friedrich Wilhelm von Kries, *Associate Professor of German*, B.A., University of British Columbia, 1957; M.A., University of Washington, 1962; Ph.D., 1965.

Henry A. Lea, *Associate Professor of German*, B.S., in Education, University of Pennsylvania, 1942; M.A., 1951; Ph.D., 1962.

Volker Meid, *Associate Professor of German*, Ph.D., University of Frankfurt, 1965.

Klaus Peter, *Assistant Professor of German*, Ph.D., University of Frankfurt, 1965.

Carroll E. Reed, *Professor of German*, B.A., University of Washington, 1936; M.A., 1937; Ph.D., Brown University, 1941.

Lawrence Ryan, *Professor of German*, B.A., University of Sydney, 1953; Ph.D., University of Tübingen, 1958.

Eva Schiffer, *Associate Professor of German*, B.S., University of Massachusetts, 1946; M.A., Radcliffe College, 1947; Ph.D., 1962.

ASSOCIATED FIVE-COLLEGE GRADUATE FACULTY

Sidonie Cassirer, *Assistant Professor of German*, (Mount Holyoke College), B.A., Hunter College, 1948; M.A., Yale, 1950; Ph.D., 1957.

Murray B. Peppard, *Professor of German*, (Amherst College), B.A., Amherst, 1939; M.A., Yale, 1942; Ph.D., 1948.

Edith A. Runge, *Professor of German*,

(Mount Holyoke College), A.B., Swarthmore, 1939; Ph.D., The Johns Hopkins University, 1942.

Anthony Scenna, *Professor of German*, (Amherst College), B.A., Amherst, 1927; M.A., Columbia, 1929; Ph.D., 1937.

Willy Schumann, *Associate Professor of German*, (Smith College), B.A., Southern Methodist University, 1952; M.A., 1953; Ph.D., Columbia University, 1959.

MASTER OF ARTS

The M.A. degree program is designed to provide both a program meaningful in itself and a foundation for further progress toward the Ph.D.

The Department reserves the right to grant the M.A. as a terminal degree; admission to candidacy for the Ph.D. requires the Department's permission and does not follow automatically upon completion of the M.A. However, a student who has shown sufficient promise in his first year's work may—after receiving special written notification from the Department—advance directly to candidacy for the Ph.D. degree. Such a student will nevertheless be required to fulfill the normal M.A. course requirements. The M.A. degree will in such cases be granted when the student has successfully completed the qualifying examination for the Ph.D. (Comprehensives). Prerequisites for admission: A B.A. degree with a major in German language and literature and indication of ability to do successful graduate work. Deficiencies in literary background and insufficient command of spoken or written German must be made up.

Language requirement: For the M.A. degree the Department requires proficiency in one language other than German or English, preferably French. The level of proficiency shall be advanced, as defined by the Graduate School.

Program of study: Ten courses (30 credit hours) are required by University regulation of all M.A. candidates. Full-time students are normally expected by the

Department to take a minimum of *three* courses in each semester of their first academic year. Those holding Teaching Assistanships in the Department are expected to complete their course requirements for the M.A. within four consecutive semesters of the regular academic year. The successful completion of the following courses is required:

- 701. Middle High German
- 706. Structure of German *or* 559. History of German
- 720. Advanced Composition and Translation
- 777. Bibliography and Methodology

In addition, the following course is required of all Teaching Assistants and strongly recommended to all who plan to teach German, especially at the college level: 564. Problems and Methods of Teaching German.

Also, *five* courses selected from the Department's offerings of literature courses, including those in Medieval literature; the five courses must include at least *two* courses in the literature of the Classic-Romantic period, at least *one* course in the literature of the 20th Century.

FIVE-COLLEGE COOPERATIVE Ph.D. REQUIREMENTS

(A.) Candidates specializing in Modern German literature.

The following courses are required:

- 702. Old High German *or* 703. Gothic
- 704. Old Norse *or* 705. Old Saxon *or* English 702. Old English
- one course in Medieval literature
- two courses in the literature of the 15th 16th, and 17th Centuries

In general, it is expected that the remaining courses will be chosen from the literature courses offered by the Department.

(B.) Candidates specializing in Medieval Literature.

The following courses are required:

- 702. Old High German

- 704. Old Norse *or* 705. Old Saxon *or* 703. Gothic *or* English 702. Old English *or* French 710. Old French
- two courses in German literature from the 15th Century to the present
- two courses in Modern German Literature

In general, it is expected that the remaining courses will be chosen from the Medieval literature courses offered by the Department. Recommendations for additional courses: one course in medieval history, one course in medieval philosophy.

(C.) Candidates specializing in Germanic Philology.

The normal program requires the completion of six courses in Philology, two courses in Linguistics, one course in Medieval Literature, and one course in Modern Literature.

Language requirement: Candidates for the Ph.D. will be required to show advanced proficiency in two foreign languages (other than German or English) pertinent to their field of specialization.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS.

Directed study in some special area of literature or philology. Open to Ph.D. candidates only, except by special permission.

Credit, 1, 2, or 3.

701. MIDDLE HIGH GERMAN.

Readings in Middle High German literature with an introduction to the grammar.

Credit, 3.

702. OLD HIGH GERMAN.

Grammar and reading of prose and poetry; an introduction to Old High German dialects.

Credit, 3.

703. GOTHIC.

Grammar and reading of texts.

Credit, 3.

704. OLD NORSE.

Grammar and reading of sagas.

Credit, 3.

705. OLD SAXON.

Grammar and reading of selections from the *Heliand*.

Credit, 3.

706. STRUCTURE OF GERMAN.

An introduction to the principles of linguistics and the structure of the German language. *Credit, 3.*

710. COMPARATIVE GERMANIC
GRAMMAR I (Phonology).

The sound systems of the various Germanic dialects from a synchronic and diachronic point of view.

Prerequisite, any two of the following—701, 702, 703, 704, 705. *Credit, 3.*

711. COMPARATIVE GERMANIC
GRAMMAR II (Morphology).

The grammatical structure of the various Germanic dialects from a synchronic and diachronic point of view.

Prerequisite, German 710. *Credit, 3.*

715. THE HEROIC EPIC.

A detailed study of *Nibelungenlied* and *Kundrun* with reference to the pre-courtly epic and the later *Dietrichsepik*. (Offered in alternate years; offered 1970).

Prerequisite, German 701. *Credit, 3.*

716. COURTLY LYRIC POETRY.

An introduction to the formal study of *Minnesang* and *Spruchdichtung* from the Kurenberger to Konrad von Würzburg with emphasis on Walther von der Vogelweide and the social and historical context of the period. (Offered in alternate years; offered 1971).

Prerequisite, German 701. *Credit, 3.*

717. THE COURTLY EPIC.

A comprehensive literary analysis of selected epics by Hartmann von Ane, Wolfram von Eschenback, Gottfried von Strassburg. (Offered in alternate years; offered 1971).

Prerequisite, German 701. *Credit, 3.*

720. ADVANCED COMPOSITION
AND TRANSLATION.

Required of all degree candidates. May be waived for students judged to have native speaking proficiency. *Credit, 3.*

730. LITERATURE OF THE
FIFTEENTH AND SIXTEENTH
CENTURIES.

Humanism and Reformation. *Credit, 3.*

733. LITERATURE OF THE SEVEN-
TEENTH CENTURY I.

Poetry and prose and relevant poetic theories. *Credit, 3.*

734. LITERATURE OF THE SEVEN-
TEENTH CENTURY II.

Drama and relevant poetic theories. *Credit, 3.*

740. LITERATURE OF THE
ENLIGHTENMENT.

From Brockes to Lessing. *Credit, 3.*

745. STORM AND STRESS.

Hamann and Herder; the Göttinger Hain; the drama of the Sturm and Drang with emphasis on the young Goethe and the young Schiller. *Credit, 3.*

749. THE CLASSICAL GOETHE.

The major works of Goethe's Weimar period; poetry, drama, fiction. *Credit, 3.*

750. SELECTED ASPECTS OF
THE LATER GOETHE.

Credit, 3.

751. GOETHE'S FAUST.

Credit, 3.

752. SCHILLER.

Schiller's literary and philosophical works. *Credit, 3.*

758. EARLY ROMANTICISM.

Philosophical background and literary works of the early Romantic movement. *Credit, 3.*

759. LATER ROMANTICISM.

Later development of Romanticism from Brentano to Heine, including the anti-Romantic tendencies of the time. *Credit, 3.*

764. NINETEENTH CENTURY
DRAMA.

Kleist, Grillparzer, Büchner, Grabbe, Hebbel. *Credit, 3.*

765. LITERATURE OF REALISM.

From Goethe to Fontane. *Credit, 3.*

770. NATURALISM.

Literary trends from 1870 to 1900 with special consideration of Naturalism and Jugendstil. *Credit, 3.*

771. TWENTIETH CENTURY
POETRY I.

Emphasis on George, Hofmannsthal, Rilke. *Credit, 3.*

772. TWENTIETH CENTURY
POETRY II.
Emphasis on Expressionist and post-Expressionist poetry. *Credit, 3.*
773. TWENTIETH CENTURY
PROSE I.
The early Thomas Mann and his generation. *Credit, 3.*
774. TWENTIETH CENTURY
PROSE II.
New trends of fiction after the First World War. *Credit, 3.*
775. TWENTIETH CENTURY
DRAMA.
From Wedekind to Brecht.
777. BIBLIOGRAPHY AND
METHODOLOGY.
An introduction to tools and methods of research. Required of all candidates for graduate degrees. To be taken concurrently with
778. STRUCTURE AND HISTORY
OF GERMAN VERSE. *Credit, 3.*
779. POST-WORLD WAR II
GERMAN LITERATURE. *Credit, 3.*
780. PROSEMINAR.
Interpretation of texts and introduction to critical terminology. Required of all candidates for graduate degrees. To be taken concurrently with 777. *Credit, 2.*
782. SPECIAL TOPICS IN
PHILOLOGY AND
MIEVIAL STUDIES. *Credit, 3.*
783. SPECIAL TOPICS IN THE
LITERATURE OF CLASSICISM. *Credit, 3.*
784. SPECIAL TOPICS IN THE
LITERATURE OF
ROMANTICISM. *Credit, 3.*
785. SPECIAL TOPICS IN THE
LITERATURE OF THE
NINETEENTH CENTURY. *Credit, 3.*
786. SPECIAL TOPICS IN THE
LITERATURE OF THE
TWENTIETH CENTURY. *Credit, 3.*

787. HISTORY OF AESTHETIC
THEORIES IN GERMANY.
General trends in the history of aesthetics. Discussion of major works since Opitz. *Credit, 3.*
788. HISTORY AND PROBLEMS
OF LITERARY CRITICISM. *Credit, 3.*
790. SEMINAR IN LITERATURE. *Credit, 3.*
791. SEMINAR IN PHILOLOGY. *Credit, 3.*
- COURSES NOT FOR MAJOR
CREDIT
- 409, 410. GRADUATE READING
COURSE.
Designed for graduate students preparing for their M.A. or Ph.D. reading examination. No previous knowledge of German required. *No credit.*
- COURSE OPEN TO BOTH
GRADUATE AND UNDER-
GRADUATE STUDENTS
(For either major or minor credit)
559. HISTORY OF GERMAN.
Introduction to the history of the German language. *Credit, 3.*
564. PROBLEMS AND METHODS
OF TEACHING GERMAN.
Various methods of teaching a foreign language based on recent developments in applied linguistics and programmed learning. Emphasized are development of teaching materials by the individual student and application of textbooks to the needs of various language courses. Prerequisite, advanced proficiency in German. *Credit, 3.*
- DUTCH STUDIES
Dutch 551. DUTCH-FLEMISH
LITERATURE.
Selections of masterpieces from the 19th and 20th Centuries, with emphasis on poetry and contemporary writers. Prerequisite, Dutch 141 or equivalent. *Credit, 3.*

SCANDINAVIAN STUDIES

Danish 551. DANO-NORWEGIAN LITERATURE.

Masterpieces of Danish and Norwegian literature, with emphasis on Ibsen, Holberg, and some attention to modern writers.
Prerequisite, Danish 140 or equivalent.

Credit, 3.

Swedish 551. SWEDISH LITERATURE.

Introduction to Swedish literature with emphasis on Strindberg and the modern authors.
Prerequisite, Swedish 140 or equivalent.

Credit, 3.

RELATED COURSES

Comparative Literature:

631. THE ENLIGHTENMENT.

641. ROMANTICISM.

642. FROM IDEALISM TO
REALISM.

651. SYMBOLISM.

652. MODERN DRAMA.

661. THE CONTEMPORARY
EUROPEAN NOVEL.

675. ANGLO-GERMAN LITERARY
RELATIONSHIPS.

Descriptions of these courses appear under
"Comparative Literature Program," p. 105.

Government

GRADUATE FACULTY

Glen Gordon, *Acting Head of the Department and Associate Professor of Government*, B.A., New York University, 1952; M.A., Chicago, 1957; Ph.D., 1963.

Dean Alfange, Jr., *Associate Professor of Government*, B.A., Hamilton, 1950; M.A., Colorado, 1960; Ph.D., Cornell, 1967.

Luther A. Allen, *Associate Professor of Government*, B.A., Williams, 1941; M.A., State University of Iowa, 1942; Ph.D., Chicago, 1952.

Loren P. Beth, *Professor of Government*, B.A., Monmouth College, 1946; M.A., Chicago, 1948; Ph.D., 1949.

David Booth, *Associate Professor of Government*, B.Sc., London School of Economics, 1952; M.A., Virginia, 1953; Ph.D., 1957.

Gerard Braunthal, *Professor of Government*, B.A., Queens College, 1947; M.A., Michigan, 1948; Ph.D., Columbia, 1953.

William E. Connolly, *Assistant Professor of Government*, B.A., Michigan (Flint), 1960; M.A., Michigan, 1962; Ph.D., 1965.

Philip B. Coulter, *Associate Professor of Government*, B.A., Centre College, 1961; Ph.D., State University of New York (Albany), 1966.

Edward E. Feit, *Associate Professor of Government*, B.A., Witwatersrand, 1944; M.A., University of South Africa, 1949; Ph.D., Michigan, 1965.

John H. Fenton, *Commonwealth Professor of Government*, B.A., Kentucky, 1948; M.A., 1951; Ph.D., Harvard, 1956.

Peter J. Fliess, *Professor of Government*, B.A., Stanford, 1944; M.A., Harvard, 1947; Ph.D., 1951.

Edwin Andrus Gere, Jr., *Associate Professor of Government*, B.A., Alfred, 1948; M.A., Pennsylvania State, 1956; Ph.D., State University of New York (Albany), 1968.

Sheldon Goldman, *Associate Professor of Government*, B.A., New York University, 1961; M.A., Harvard, 1964; Ph.D., 1965.

Franklin W. Houn, *Professor of Government*, B.A., National Chenk-Chih University, 1946; M.A., Denver, 1950; Ph.D., Wisconsin, 1953.

Irving Howards, *Professor of Government*, B.A., Wisconsin, 1953; M.A., 1955; Ph.D., 1957.

Jerome B. King, *Associate Professor of Government*, B.A., Dartmouth, 1949; M.A., Stanford, 1954; Ph.D., 1958.

John W. Lederle, *Professor of Government*, B.A., Michigan, 1933; M.A., 1934; LL.B., 1936; Ph.D., 1942.

Guenter Lewy, *Professor of Government*,

B.S.S., City College of New York, 1951; M.A., Columbia, 1952; Ph.D., 1957.

Lewis C. Mainzer, *Associate Professor of Government*, B.A., New York University, 1948; M.A., Chicago, 1950; Ph.D., 1956.

John M. Maki, *Professor of Government*, B.A., Washington, 1932; M.A., 1936; Ph.D., Harvard, 1948.

Leila Meo, *Associate Professor of Government*, B.A., American University at Cairo, 1947; M.A., Syracuse, 1949; Ph.D., Indiana, 1961.

Felix E. Oppenheim, *Professor of Government*, Docteur-en-droit, Brussels, 1938; Ph.D., Princeton, 1942.

Robert Anthony Shanley, *Assistant Professor of Government*, B.A., Columbia, 1946; M.A., 1948; Ph.D., Georgetown, 1955.

Hans Speier, *Robert Morrison MacIver Professor of Government and Sociology*, Ph.D., Heidelberg, 1928.

Anwar H. Syed, *Professor of Government*, B.A., University of the Panjab, 1946; M.A., 1951; M.A., Chicago, 1953; M.A., Pennsylvania, 1954; Ph.D., 1957.

Ferenc A. Vali, *Professor of Government*, Doctor Juris, Budapest, 1927; Ph.D., London, 1932.

Howard Wiarda, *Associate Professor of Government*, B.A., Michigan, 1961; Ph.D., Florida, 1965.

ASSOCIATED FIVE-COLLEGE GRADUATE FACULTY

Stanley Rothman, *Assistant Professor of Government*, (Smith College), B.S.E., City College of New York, 1949; M.A., Brown, 1951; Ph.D., Barnard, 1958.

UNIVERSITY OF MASSACHU- SETTS/BOSTON GRADUATE FACULTY

George Goodwin, Jr., *Professor of Government*, B.S., Williams, 1943; Ph.D., Harvard, 1955.

David Nichols, *Assistant Professor of Government*, A.B., Clark University 1961; Ph.D., Massachusetts Institute of Technology, 1968.

UNIVERSITY OF MASSACHUSETTS

Glen Tinder, *Professor of Government*, B.A., Pomona College, 1943; M.A., Claremont Graduate School, 1948; Ph.D., University of California (Berkeley), 1952.

The Department of Government offers graduate work leading to the Master of Arts and Doctor of Philosophy degrees. Detailed information on requirements for degrees may be obtained from the Department of Government.

The Department's courses are categorized in eight subfields. In most of these subfields there is a Pro-Seminar which prepares beginning students for the more specialized advanced seminars by acquainting them with the fundamental concepts, theories, modes of inquiry, and research findings in a subfield. In all eight subfields there are Tutorials and Directed Studies. The Tutorial is basically a reading course, the content and format of which are arranged by agreement of one or more students and a professor. Generally, a Tutorial treats a topic of their mutual interest which is not adequately covered by existing courses. The Directed Studies course is a specialized, advanced seminar with regular meetings which covers a topic not covered in other seminars. It is an in-depth study of a particular aspect of a subfield, the content of which varies with the interests of professors and students.

COURSES OPEN TO GRADUATE STUDENTS ONLY (For either major or minor credit)

700-709 AMERICAN GOVERNMENT AND POLITICS

700. PRO-SEMINAR IN AMERICAN
POLITICAL BEHAVIOR.

701. TUTORIAL IN AMERICAN
GOVERNMENT AND POLITICS.

702. DIRECTED STUDIES IN
AMERICAN GOVERNMENT
AND POLITICS.

703. LEGISLATIVE BEHAVIOR.

Selected topics in American legislative systems, national and state, with attention to major research techniques and recent theoretical developments. *Credit, 3.*

704. AMERICAN POLITICAL
PARTY SYSTEMS.

The structure and activities of American parties and their impact on individual and group political behavior and on government and public policy. Focus on both national and state party systems. *Credit, 3.*

710-719 COMPARATIVE POLITICS

710. PRO-SEMINAR IN
COMPARATIVE POLITICS.

711. TUTORIAL IN
COMPARATIVE POLITICS.

712. DIRECTED STUDIES IN
COMPARATIVE POLITICS.

713. COMPARATIVE POLITICAL
PARTIES.

The ideology, structure and dynamics of diverse types of political parties, party systems and electoral systems, in an effort to suggest interrelationships. *Credit, 3.*

714. MILITARY POLITICS.

Comparative study of some specific contemporary problems in civilian-military relations. *Credit, 3.*

720-729 INTERNATIONAL
RELATIONS

720. PRO-SEMINAR IN
INTERNATIONAL RELATIONS.

721. TUTORIAL IN INTERNATIONAL
RELATIONS.

722. DIRECTED STUDIES IN
INTERNATIONAL RELATIONS.

723. PROBLEMS OF INTERNATIONAL
RELATIONS.

Analysis of major problems in international relations.
Prerequisite, Gov 554 or equivalent. *Credit, 3.*

724. INTERNATIONAL LAW
AND ORGANIZATION.

Analysis of major problems in international organizations.
Prerequisite, Gov 656 or 657 or equivalent. *Credit, 3.*

725. THEORY OF INTERNATIONAL
POLITICS.

Analysis and conceptualization of the forces and drives that condition politics among nations. *Credit, 3.*

730-739 PUBLIC ADMINISTRATION

730. PRO-SEMINAR IN PUBLIC
ADMINISTRATION.

731. TUTORIAL IN
PUBLIC ADMINISTRATION.

732. DIRECTED STUDIES IN
PUBLIC ADMINISTRATION.

733. PUBLIC ADMINISTRATION:
ORGANIZATION.

Behavior within governmental bureaucracy, in terms of the interaction between the individual and organizational influences. *Credit, 3.*

734. PUBLIC ADMINISTRATION:
RESPONSIBILITY

Problems of political responsibility of government bureaucracy within specific constitutional systems. *Credit, 3.*

735. COMPARATIVE PUBLIC
ADMINISTRATION.

Comparative study and analysis of the government administrative systems of the U.S., Britain, Canada, France, the U.S.S.R., and selected other countries.
Prerequisite, Gov 572 or equivalent. *Credit, 3.*

740-749 PUBLIC LAW

740. PRO-SEMINAR IN PUBLIC LAW.

741. TUTORIAL IN PUBLIC LAW.

742. DIRECTED STUDIES IN
PUBLIC LAW.

743. LAW AND THE
POLITICAL PROCESS.

The interrelationships between law and politics, and the necessity for law in organized societies. Prerequisite, any two of Government 590, 591, and 592 or equivalent. *Credit, 3.*

744. THEORIES OF LAW AND
JUDICIAL PROCESS.

The theories of law, jurisprudence, and/or judicial behavior.

Prerequisite, any two of Government 590, 591, and 592 or equivalent. *Credit, 3.*

750-759 STATE AND
LOCAL POLITICS

750. PRO-SEMINAR IN STATE AND
LOCAL POLITICS.

751. TUTORIAL IN STATE AND
LOCAL POLITICS.

752. DIRECTED STUDIES IN STATE
AND LOCAL POLITICS.

753. URBAN POLITICAL SYSTEMS.

Comparative analysis of relationships among socioeconomic environment, political structures and processes, and public policy outcomes in cities. Research applications of contemporary concepts and theories.

Credit, 3.

754. THEORY OF LOCAL
GOVERNMENT.

Theories of local government, which provide a base for efforts to generalize about uniformities in the governmental process.

Credit, 3.

760-769 POLITICAL THEORY

760. PRO-SEMINAR IN POLITICAL
THEORY.

761. TUTORIAL IN POLITICAL
THEORY.

762. DIRECTED STUDIES IN
POLITICAL THEORY.

763. RECENT POLITICAL THEORY.

Systematic analysis of contemporary theories about the possibilities and limits of operationalism, behavioralism and the decision-making approach in political science.

Credit, 3.

764. CHURCH AND STATE.

Relations between western and non-western religions and the state; analysis of the ideas and other forces underlying this relationship, especially since 1918.

Credit, 3.

765. THE INDIVIDUAL AND
THE STATE.

The problem of political obligation in political theory and in its historical and social contexts: the medieval right of resistance, the social contract, anarchism, resistance to totalitarianism, non-violent resistance, conscientious objection to war.

Credit, 3.

766. PHILOSOPHICAL FOUNDATIONS
OF POLITICAL SCIENCE.

A critical examination of the principal contemporary views concerning the methods of gaining knowledge of political phenomena.

Credit, 3.

767. EMPIRICAL RESEARCH IN
POLITICAL BEHAVIOR.

Introduction to research techniques as applied to special problems in the field of political behavior. Emphasis on various approaches to the study of the individual voter, the American politician, interest groups and legislatures.

Credit, 3.

770-779 AREA STUDIES

771. TUTORIAL IN AREA STUDIES.

772. DIRECTED STUDIES IN AREA
STUDIES.

773. POLITICS OF SOUTH ASIA.

Intensive study of selected problems relating to the government and politics of India, Pakistan, and Ceylon.

Credit, 3.

774. POLITICS OF EAST ASIA.

Intensive study of selected problems relating to the politics of China, Japan and other Asian countries.

Credit, 3.

775. EAST ASIAN FOREIGN POLICIES.

The foreign policies of China, Japan and other East Asian countries in modern times and of Western diplomacy in the area.

Credit, 3.

776. AFRICAN POLITICS.

Selected contemporary problems in African government and politics.

Credit, 3.

777. LATIN AMERICAN POLITICS.

Comparative study of Latin American politics and government.

Credit, 3.

778. EUROPEAN POLITICS.

Selected political cultures and systems in Europe. *Credit, 3.*

800. MASTER'S THESIS. *Credit, 6.*

900. DOCTORAL DISSERTATION. *Credit, 30.*

COURSES OPEN TO BOTH
GRADUATE AND UNDER-
GRADUATE STUDENTS

(For either major or minor credit)

501. ANCIENT AND MEDIEVAL
POLITICAL THOUGHT.

Development of political thought and its relation to cultural and institutional growth from the time of the Greeks to the end of the Middle Ages. *Credit, 3.*

502. MODERN POLITICAL
THOUGHT.

Development of political thought and its relation to cultural and institutional growth from the rise of the modern state to the present. *Credit, 3.*

503. PROBLEMS IN POLITICAL
THOUGHT.

A systematic treatment of some basic problems of political science, political ethics, and political philosophy through the study of selected classical and modern political thinkers. *Credit, 3.*

536. THE GOVERNMENT AND
POLITICS OF SOUTH AND

Development, organization and functioning of the Communist party; governmental organization and the administrative process; terror as a system of power; organization for governmental control in industry and agriculture; Soviet foreign policy, its formation and execution. *Credit, 3.*

537. GOVERNMENTS OF
CHINA AND JAPAN.

Analysis of the political ideologies, party movements, governmental institutions, and major domestic and foreign policies of contemporary China and Japan. *Credit, 3.*

538. GOVERNMENT AND
POLITICS OF SOUTH AND
SOUTHEAST ASIA.

A comparative study of the institutions and

dynamics of government and politics in South and Southeast Asia, especially India, Pakistan, Indonesia, and Malaysia, with particular reference to issues of political stability, economic development, and relations with the U.S. and other great powers. *Credit, 3.*

540. GOVERNMENT AND POLITICS
OF SOUTH AMERICA.

A comparative analysis of the interest groups, political parties, and governmental institutions of the South American countries with special emphasis on the background and political culture in which Latin American politics and government takes place. *Credit, 3.*

541. GOVERNMENT AND POLITICS
OF CENTRAL AMERICA
AND THE CARIBBEAN.

A comparative analysis of the interest groups, political parties, and governmental institutions of the Central American and Caribbean countries with special emphasis on communism and the role of the U.S. *Credit, 3.*

542. THE POLITICS OF
SUB-SAHARAN AFRICA.

The organization and processes of African politics, centering on the general political problems facing contemporary African governments. *Credit, 3.*

543. COMPARATIVE AFRICAN
GOVERNMENTS.

A comparative study of the political process in five African states. *Credit, 3.*

544. POLITICAL DEVELOPMENT
AND MODERNIZATION.

A comparative analysis of political change and development in the emerging nations. *Credit, 3.*

548. GREAT BRITAIN AND
THE COMMONWEALTH.

The practice of parliamentary government in Great Britain and the Commonwealth countries, with emphasis on the development of the conception of the Commonwealth, the institutions through which the Commonwealth operates, and in its contemporary world politics. *Credit, 3.*

573. PUBLIC PERSONNEL
ADMINISTRATION.

The personnel function in bureaucracy; patronage and merit; career service and political executives; authority and informal organization; employee rights and collective action. *Credit, 3.*

575. COMPARATIVE PUBLIC
POLICY.

A comparative analysis of policy formation: the process of social and economic policy decision-making in selected industrial societies; the interaction of institutions, ideas, and power in decisions concerning a social welfare, economic planning, and related policy areas. *Credit, 3.*

576. POLITICAL THEORY,
IDEOLOGY, AND PUBLIC
POLICY.

The evaluation of social policy: a consideration of some of the normative issues raised in controversies over selected cases of social and economic policy in the light of the main traditions of Western political thought and of recent work on the logical and ethical aspects of social choice. *Credit, 3.*

577. ARMED FORCES AND
POLITICAL POLICY.

A comparative study of civilian-military relations in the Western and non-Western nations, concentrating both on regular and irregular armed forces. *Credit, 3.*

590. CONSTITUTIONAL LAW.

The United States Constitution as interpreted by decisions of the Supreme Court. *Credit, 3.*

591. CIVIL LIBERTIES.

The development in American Constitutional law of the concept of civil liberty, including the following fields: free speech and religion, fair trial, and race discrimination. The function of courts in the safeguarding of these liberties. *Credit, 3.*

592. POLITICS, LAW AND
JUDICIAL BEHAVIOR.

Law as the political and social means of adjusting community needs and desires to governmental policy. Judicial behavior in law making and law enforcement. *Credit, 3.*

603. AMERICAN POLITICAL
THOUGHT.

The development of American political thought from Colonial times to the present. *Credit, 3.*

606. COMMUNIST POLITICAL
THOUGHT.

The philosophic and religious origins of Communism in Western and Eastern Europe. Analysis of the classics from Marx to Khrushchev. *Credit, 3.*

621. THE PRESIDENCY IN
AMERICAN GOVERNMENT.

The growth of the executive in United States Government. Varying conceptions of the presidential office. Constitutional and political aspects of the office in legislation, administration and conduct of foreign and military affairs. The president as party leader. *Credit, 3.*

622. THE LEGISLATIVE PROCESS.

The role of the legislature in national and state government. The functions of legislatures; legislative procedures; the role played by political parties and pressure groups in the legislative process. Emphasis on research. *Credit, 3.*

623. PUBLIC OPINION IN POLITICS.

Opinion and communication as aspects of the political process with emphasis upon communication through mass media. The relations between mass attitudes and communication and political institutions and the formation of public policy. *Credit, 3.*

655. AMERICAN FOREIGN POLICY.

Constitutional, political and administrative considerations which influence the formulation and execution of American foreign policy. Special emphasis on current issues. *Credit, 3.*

656. INTERNATIONAL LAW.

The origin, character, and function of international law. *Credit, 3.*

657. INTERNATIONAL
ORGANIZATION.

International organization in the twentieth century, with emphasis upon the United Nations and regional organizations. *Credit, 3.*

659. WESTERN EUROPE AND THE
ATLANTIC COMMUNITY.

An analysis of the emerging institutional patterns of the West European and Atlantic communities. A study of the major political, military, and economic regional organizations.

Credit, 3.

660. SOVIET FOREIGN POLICY.

An analysis of continuity and change in Soviet perceptions, goals, methods, and priorities in foreign policy with emphasis upon the period since World War II.

Credit, 3.

674. ADMINISTRATIVE LAW.

Governmental activities in the regulation of industry, agriculture, and labor, with emphasis on the legal framework within which these activities operate.

Credit, 3.

691, 692. SEMINAR.

Special problems in the field of government. Prerequisite, permission of the department.

Credit, 3.

INTERDEPARTMENTAL COURSES

SOCIAL SCIENCE 550. AFRICA,
SOUTH OF THE SAHARA.

Recent political, economic, and social developments in the principal countries in Africa south of the Sahara.

Prerequisites, at least two courses in one or more of the following fields: government, economics, sociology.

Credit, 3.

SOCIAL SCIENCE 569. INDIA
AND SOUTHEAST ASIA.

Recent political, economic, and social developments in India and the countries of South and Southeast Asia.

Prerequisites, at least two semester courses in one or more of the following fields: government, economics, sociology.

Credit, 3.

Environmental Sciences

GRADUATE FACULTY

Haim B. Gunner, *Associate Professor of Environmental Sciences*, B.S., Toronto, 1946; M.S., Manitoba, 1948; Ph.D., Cornell, 1962.

Warren Litsky, *Commonwealth Professor of Environmental Sciences*, B.A., Clark,

1945; M.S., Massachusetts, 1948; Ph.D., Michigan State, 1951.

William S. Mueller, *Associate Professor of Environmental Sciences*, B.S., Illinois, 1927; M.S., Rutgers, 1928; Ph.D., Massachusetts, 1939.

COURSES OPEN TO GRADUATE STUDENTS ONLY

745. MICROBIAL ECOLOGY OF THE SOIL.

The biochemistry and physiology of interactions among microorganisms in, and their relation with, the soil environment. Lectures, discussion and a critical review of current literature on the subject.

Prerequisite, PLSoil 585 or permission of instructor.

Credit, 3. Mr. Gunner.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

501. INTRODUCTORY ENVIRON- MENTAL BIOLOGY.

The response of the biota to environmental stress induced by air, water and soil pollutants.

Prerequisites, Botany 101, Zool 101 or equivalent. Three class hours, demonstrations, field trips.

Credit, 3. Staff.

550. MICROBIAL ECOLOGY OF MARINE ENVIRONMENT.

The ecology, function and importance of microorganisms in the marine environment including the underlying sediments; their role in the food chain and productivity of the seas and estuaries; and the factors influencing seasonal and geographical population dynamics.

Credit, 2. Mr. Litsky.

585. MICROBIOLOGY OF THE SOIL.

Soil microorganisms; their distribution, ecology and transformation of organic and inorganic substrates. Microbiology of the rhizosphere and the biological equilibrium.

Prerequisites, Microbiol 250 or permission of instructor.

Credit, 3. Mr. Gunner.

586. SPECIAL PROBLEMS.

Individual work on an assigned problem or project in the field of environmental sciences.

Credit, 1-3. Staff.

Hispanic Languages and Literatures

GRADUATE FACULTY

Irving P. Rothberg, *Acting Head and Professor of Spanish*, B.S., Temple University, 1948; M.A., Pennsylvania State, 1951; Ph.D., 1954.

Harold L. Boudreau, *Adviser, Graduate Studies and Professor of Spanish*, B.A., Illinois, 1948; M.A., 1950; Ph.D., Wisconsin, 1965.

Dámaso Alonso, *Visiting Professor of Spanish*, Doctor en Filosofía y Literatura, Madrid, 1928.

Robert L. Bancroft, *Associate Professor of Spanish*, B.A., Washington, 1935; M.A., 1947; Ph.D., Columbia, 1957.

Pedro Barreda-Tomás, *Assistant Professor of Spanish*, M.A., State University of New York at Buffalo, 1966; Ph.D., 1969.

Blanche De Puy, *Associate Professor of Spanish*, B.A., Wellesley, 1942; M.Litt., Pittsburgh, 1951; Ph.D., Stanford, 1961.

Francisco Fernández-Turiénzo, *Assistant Professor of Spanish*, B.A., Universidad Pont. de Salamanca, 1956; M.A., University of Basilea (Switzerland), 1965; Ph.D., 1965.

Sumner M. Greenfield, *Professor of Spanish*, B.A., Boston College, 1946; M.A., Boston University, 1947; M.A., Harvard, 1951; Ph.D., 1957.

Jules Piccus, *Professor of Romance Languages*, B.A., Queens, 1942; M.A., Princeton, 1949; Ph.D., 1951.

Harlan G. Sturm, *Assistant Professor of Spanish*, B.A., University of Minnesota, 1963; M.A., 1965; Ph.D., University of North Carolina, 1967.

Sidney F. Wexler, *Professor of Spanish*, B.S., New York University, 1932; M.A., Colorado, 1933; Ph.D., New York University, 1952.

ASSOCIATED FIVE-COLLEGE GRADUATE FACULTY

W. Calvin Cannon, *Professor of Spanish*,

UNIVERSITY OF MASSACHUSETTS

(Amherst College), B.A., Baylor, 1952; Ph.D., University of Texas, 1959.

Joan E. Ciruti, *Associate Professor of Spanish*, (Mount Holyoke College), B.A., Southeastern Louisiana College, 1950; M.A., University of Oklahoma, 1954; Ph.D., Tulane, 1959.

Ernest A. Johnson, Jr., *Professor of Romance Languages*, (Amherst College), B.A., Amherst, 1939; M.A., Chicago, 1940; Ph.D., Harvard, 1950.

Erna R. Berndt Kelley, *Associate Professor of Spanish*, (Smith College), B.A., Wisconsin, 1954; M.A., 1955; Ph.D., 1959.

Joaquina Navarro, *Professor of Spanish*, (Smith College), B.A., Instituto Escuela, Madrid, 1934; M.A., Columbia, 1942; Ph.D., 1954.

Eugenio Suárez-Galbán, *Assistant Professor of Spanish*, (Mount Holyoke College), B.A., Boston College, 1961; M.A., New York University, 1964; Ph.D., 1967.

COURSE REQUIREMENTS FOR THE M.A.

Students are required to have oral and written proficiency in Spanish before admission to candidacy for advanced degrees. In addition to the general requirements for the degree at the University, the following special requirements must be met:

1. Spanish 705 (Bibliography and Methods).
2. A reading knowledge of a second foreign language pertinent to the student's program.
3. Spanish 800 may be elected for not more than nine credits.
4. Terminal examinations as follows:
 - a. Comprehensive examination.
 - b. For those electing Spanish 800, oral defense of thesis.

Students are advised to elect Spanish 710 (History of the Spanish Language).

THE FIVE-COLLEGE COOPERATIVE PH.D. IN SPANISH

The University requirements for admis-

sion to the Graduate School require acceptance by the department. For the Cooperative Ph.D. in Spanish, acceptance is by all four departments.

In addition to the general requirements for the degree at the University, the following special requirements must be met:

1. Required courses:
 - a. Spanish 705 (Bibliography and Methods), or the equivalent knowledge.
 - b. One semester each of Romance Philology and the History of the Spanish Language. (Both Spanish 710.)
 - c. Spanish 900, Doctoral Dissertation.
2. A reading knowledge at the intermediate or advanced level as determined by the department, of Latin, French, and either German or another foreign language pertinent to the student's program.
3. Oral and written comprehensive examinations demonstrating proficiency in the language, a knowledge of the whole body of Spanish and Spanish-American literature and of the history of the language, and evidence of knowledge of the history and the culture of Hispanic countries.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

420. ADVANCED CONVERSATIONAL SPANISH.

Intended primarily for first-year graduate students. Intensive oral practice to insure fluency. Phonetic variants within the Hispanic world.

One or two hours per week throughout the year. *Credit, 2.*

700. PROBLEM COURSE.

Directed study in some phase of linguistics or literature. *Credit, 1-6.*

705. BIBLIOGRAPHY AND METHODS OF LITERARY RESEARCH.

Credit, 3.

Specific topics of Spanish 710 through 799

will be announced in the spring of the preceding academic year.

710. THE SPANISH LANGUAGE.

The development of Spanish and its relationship to other Romance languages.

Credit, 3-12.

715. SEMINARS IN EARLY MEDIEVAL LITERATURE.

A phase of Spanish literature of the 12th and 13th Centuries.

Prerequisite, a knowledge of Latin, Spanish 710, or equivalent. *Credit, 3-12.*

720. SEMINARS IN LATER MEDIEVAL LITERATURE.

A phase of Spanish literature of the 14th and 15th Centuries. *Credit, 3-12.*

730. SEMINARS IN RENAISSANCE AND BAROQUE LITERATURE.

Aspects of Spanish intellectual and spiritual movements of the 16th and 17th Centuries as reflected in Renaissance and Baroque literature. *Credit, 3-12.*

735. SEMINARS IN 16th AND 17th CENTURY POETRY.

The poets and poetic currents of the Spanish Golden Age. *Credit, 3-12.*

740. SEMINARS IN GOLDEN AGE FICTION.

Aspects of the novel in 16th and 17th Century Spain. *Credit, 3-12.*

745. SEMINARS IN THE 16th AND 17th CENTURY THEATER.

The development and apogee of the Spanish *comedia* in the Golden Age.

Credit, 3-12.

755. SEMINARS IN 18th CENTURY LITERATURE.

Phases of Spanish thought and literature in the 18th Century. *Credit, 3-12.*

760. SEMINARS IN 19th CENTURY POETRY AND DRAMA.

Aspects of the theater and poetry of 19th Century Spain. *Credit, 3-12.*

765. SEMINARS IN 19th CENTURY PROSE.

Nineteenth-Century Spanish thought or narrative literature. *Credit, 3-12.*

770. SEMINARS IN INTELLECTUAL AND ESTHETIC MOVEMENTS.
Intellectual and esthetic developments in the modern Hispanic world. *Credit, 3-12.*

775. SEMINARS IN 20th CENTURY POETRY AND DRAMA.
Phases of modern Spanish poetry and theater. *Credit, 3-12.*

780. SEMINARS IN 20th CENTURY PROSE.
The novel, short story, and essay in modern Spain. *Credit, 3-12.*

785. SEMINARS IN SPANISH-AMERICAN POETRY AND DRAMA.
Individual Spanish-American poets or dramatists, and in groups or movements. *Credit, 3-12.*

790. SEMINARS IN SPANISH-AMERICAN PROSE.
The novel, short story, chronicle, and essay in Spanish America. *Credit, 3-12.*

799. SEMINARS IN HISPANIC LANGUAGE AND LITERATURE.
Phases of Spanish language and Spanish and Spanish-American literature that involve two or more of the areas of courses number 710 through 790. *Credit, 3-12.*

800. MASTER'S THESIS.
Maximum credit, 9.

900. DOCTORAL DISSERTATION.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

610. STYLISTICS.
The elements of stylistics. *Credit, 3.*

615. SPANISH LITERATURE TO 1500.
Spanish literature in the Middle Ages and Renaissance. *Credit, 3.*

625. PROSE OF THE GOLDEN AGE.
Major prose works in 16th and 17th Century Spain with emphasis on the novel, excluding the *Quijote* *Credit, 3.*

630. CERVANTES.
Intensive study of the *Quijote* *Credit, 3.*

635. LYRIC POETRY OF THE GOLDEN AGE.
Spanish poetry of the 16th and 17th Centuries from Garcilaso to Góngora. *Credit, 3.*

640. DRAMA OF THE GOLDEN AGE.
The *comedia* during the period of maximum creation, 1556-1681. *Credit, 3.*

655. SPANISH LITERATURE FROM 1700 THROUGH ROMANTICISM.
Spanish literature and thought in the Eighteenth Century and the Romantic movement. *Credit, 3.*

665. THE SPANISH NOVEL AND DRAMA IN THE LATE NINETEENTH CENTURY.
Post-Romantic literature of Spain in the Nineteenth Century with emphasis on prose fiction. *Credit, 3.*

670. SPANISH-AMERICAN LITERATURE TO 1900.
A general view, with intensive study of selected major works. *Credit, 3.*

672. MAJOR SPANISH-AMERICAN WRITERS.
Intensive study of major figures in Spanish-American literature; Sarmiento, Darío, Rodó, Reyes and others. *Credit, 3.*

675. NARRATIVE PROSE IN MODERN SPANISH AMERICA.
Spanish-American prose fiction in the late Nineteenth and Twentieth Centuries. *Credit, 3.*

681. DRAMA AND POETRY IN TWENTIETH-CENTURY SPAIN.
Spanish poetry and the theater from the Generation of '98 to the present. *Credit, 3.*

682. SPANISH PROSE IN THE TWENTIETH CENTURY.
The novel and essay since 1898. *Credit, 3.*

COURSE NOT FOR MAJOR CREDIT

409. GRADUATE READING COURSE.
Designed for graduate students preparing for their M.A. or Ph.D. reading examination. No previous knowledge of Spanish required. *No credit. Staff.*

RELATED COURSES:

Comparative Literature:

621. RENAISSANCE PERSPECTIVES.

622. THE SHAPE OF THE
RENAISSANCE.

631. THE ENLIGHTENMENT.

641. ROMANTICISM.

642. FROM IDEALISM TO
REALISM.

651. SYMBOLISM.

652. MODERN DRAMA.

661. THE CONTEMPORARY
EUROPEAN NOVEL.

671. EUROPEAN EPIC POETRY.

*Descriptions of these courses appear under
"Comparative Literature Program," p. 105.*

History

GRADUATE FACULTY

Archibald R. Lewis, *Head of the Department and Professor of History*, A.B., Princeton University, 1936; M.A., 1939; Ph.D., 1940.

Dean Albertson, *Professor of History*, B.A., California at Berkeley, 1942; M.A., 1947; Ph.D., Columbia, 1955.

Winfred E.A. Bernhard, *Associate Professor of History*, B.S., Harvard, 1942; M.A., Columbia, 1948; Ph.D., 1961.

Paul S. Boyer, *Associate Professor of History*, A.B., Harvard, 1960; M.A., 1961; Ph.D., 1966.

Theodore C. Caldwell, *Professor Emeritus of History*, B.A., College of Wooster, 1925; M.A., Harvard, 1927; Ph.D., Yale, 1934.

Milton Cantor, *Associate Professor of History*, B.A., Brooklyn College, 1947; M.A., Pennsylvania, 1948; Ph.D., Columbia, 1954.

Harold W. Cary, *Professor Emeritus of History*, B.A., Williams College, 1925; M.A., Harvard, 1926; Ph.D., Yale, 1938.

Miriam U. Chrisman, *Associate Professor of History*, B.A., Smith, 1941; M.A., American University, 1948; M.A., Smith, 1955; Ph.D., Yale, 1962.

William A. Davis, *Associate Professor of History*, B.A., Colgate, 1935; M.A., Harvard, 1938; Ph.D., 1956.

Mario S. DePillis, *Associate Professor of History*, B.A., Chicago, 1952; M.A., 1954; Ph.D., Yale, 1961.

Harold J. Gordon, Jr., *Professor of History*, B.A., University of Richmond, 1940; M.A., Yale, 1948; Ph.D., 1953.

Louis S. Greenbaum, *Professor of History*, B.A., Wisconsin, 1950; M.A., 1951; Ph.D., Harvard, 1955.

Lewis Hanke, *Professor of History*, B.S., Northwestern University, 1924; M.A., 1925; Ph.D., Harvard, 1936.

Robert A. Hart, *Associate Professor of History*, B.A., Indiana University, 1954; M.A., 1959; Ph.D., 1964.

Joseph M. Hernon, Jr., *Associate Professor of History*, B.A., Catholic University, 1959; Ph.D., Trinity College, Dublin University, 1963.

Vincent Ilardi, *Professor of History*, A.B., Rutgers, 1952; A.M., Harvard, 1953; Ph.D., 1958.

William M. Johnston, *Associate Professor of History*, B.A., Harvard, 1958; Ph.D., 1965.

George E. Kirk, *Professor of History*, A.B., Queens College, Cambridge, 1932; Diploma in Classical Archaeology, 1933; M.A., 1936.

Gerald W. McFarland, *Associate Professor of History*, A.B., University of California at Berkeley, 1960; M.A., Columbia, 1964; Ph.D., 1965.

Robert H. McNeal, *Professor of History*, B.A., Yale College, 1952; M.A., Columbia University, 1954; Ph.D., 1958.

Stephen B. Oates, *Associate Professor of History*, B.A., Texas, 1958; M.A., 1960; Ph.D., Texas, 1968.

Robert A. Potash, *Professor of History*, A.B., Harvard, 1942; M.A., 1947; Ph.D., 1953.

Howard H. Quint, *Professor of History*, B.A., Yale, 1940; M.A., Stanford, 1942; Ph.D., Johns Hopkins, 1947.

Leonard L. Richards, *Assistant Professor of History*, A.B., University of California at Berkeley, 1956; M.A., 1961; Ph.D., University of California at Davis, 1968.

Roland Sarti, *Assistant Professor of History*, B.A., City College of New York, 1960; M.A., Rutgers, 1962; Ph.D., 1966.

Marvin Swartz, *Assistant Professor of History*, A.B., Princeton University, 1963; M.A., Yale, 1964, Ph.D., 1969.

Jack Tager, *Associate Professor of History*, B.A., Brooklyn College, 1958; M.A., University of California, Berkeley, 1959; Ph.D., University of Rochester, 1965.

Jack M. Thompson, *Assistant Professor of History*, B.A., South Carolina, 1949; M.A., 1953; Ph.D., 1958.

Ronald D. Ware, *Associate Professor of History*, B.A., Cincinnati, 1950; M.S., Wisconsin, 1956; Ph.D., 1960.

Franklin B. Wickwire, *Associate Professor of History*, B.A., Hanover College, 1952; M.A., Indiana University, 1956; Ph.D., Yale, 1961.

David Wyman, *Associate Professor of History*, A.B., Boston University, 1951; M.Ed., Plymouth Teachers College, 1961; A.M., Harvard, 1962; Ph.D., 1966.

UNIVERSITY OF MASSACHUSETTS /BOSTON GRADUATE FACULTY

Paul F. Boller, Jr., *Professor of History*, B.A., Yale, 1939; Ph.D., 1947.

Thomas N. Brown, *Professor of History*, B.S., Boston College, 1948; M.A., Harvard, 1950; Ph.D., 1956.

Paul A. Gagnon, *Professor of History*, A.B., University of Massachusetts, 1950; A. M., Harvard, 1951; Ph.D., 1960.

Richard H. Powers, *Professor of History*, B.A., Ohio State University, 1948; M.A., 1949; Ph.D., 1953.

Louis Ruchames, *Professor of History*, B.S.S., City College of New York, 1937; M.A., Columbia, 1940; Ph.D., 1951.

UNIVERSITY OF MASSACHUSETTS

GRADUATE PROGRAMS IN HISTORY

More complete information on graduate study in History may be found in the departmental statement, Graduate Program in History, available from the History office. Because requirements are currently under revision, students are advised to consult the most recent edition of this statement.

THE Ph.D. PROGRAM

The Department of History offers doctoral work in five areas: Europe (including Russia), United States, Great Britain, Latin America, Near and Middle East. Each of these areas is subdivided into a number of fields. The candidate will choose an area of specialization and within this area a major field.

A student entering the University with previous graduate training at other institutions may be admitted to the graduate program with advanced standing at the discretion of the department. The department's Graduate Committee will evaluate his previous graduate training and he will be informed of his exact status upon notification of admission to the department's graduate program.

At the outset of his work, each doctoral candidate is assigned a Guidance Committee whose function it is to advise and approve courses and doctoral fields most appropriate to the student's designated major interests. A minimum of fifteen courses is required, no less than four of which will be graduate seminars in three fields. These seminars concentrate on research training and the techniques of historical writing. The candidate for the Ph.D. will be in full-time residence for no less than one academic year (two semesters).

All Ph.D. candidates must pass a departmental examination demonstrating reading proficiency in the literature of one foreign language. Students who plan to specialize in areas for which more than one foreign language is necessary for scholarly work must pass departmental

examinations demonstrating reading proficiency in the literature of such relevant languages.

Each candidate for the Ph.D. will be responsible for four fields, at least two of which will be in his area of specialization. Not more than two fields may be offered which deal with the history of a particular nation. The substitution of fields outside the Department of History may be elected upon recommendation of the student's adviser and approval by the department's Director of Graduate Studies. Satisfactory completion of the General Examination admits the student to formal candidacy for the Ph.D. degree. A dissertation is required of each candidate for the Ph.D.

THE M.A. PROGRAMS

I. REGULAR MASTER OF ARTS PROGRAM.

1. Each graduate student entering this program will select a major field of concentration from among those offered by the History Department for doctoral work. Selection of the student's adviser will be based upon his selection of field. All M.A. candidates must demonstrate a reading proficiency in one foreign language. Students who plan to specialize in areas for which English is not the basic language will be required to demonstrate to the department a reading proficiency in the relevant foreign language during the first semester of graduate study.

Admission to seminars and topics courses in some fields may depend upon the student's ability in one or more foreign languages.

2. Basic Course Requirements.

- a. Each student must complete eight courses for the Master's degree of which at least six must be in the 700-800 series. For two of these courses the student may elect to substitute the preparation of a thesis.
- b. Each student may take two courses in associated disciplines at the discretion of his adviser.

- c. Four courses is the normal permissible program per semester.
- d. Each student will complete a minimum of one course in historiography.
- e. Each student will complete two seminars with the minimum grades of B, unless he chooses to write a thesis, in which case he may be exempted from one seminar.

3. The candidate must pass an oral examination on his primary field of interest, to be conducted by an examining committee of three members of the graduate faculty. The student is expected to complete his program within a six-year period.

II. MASTER OF ARTS FOR TEACHERS PROGRAM

(This program is being revised)

This program emphasizes the special needs of secondary school teachers; it stresses breadth of knowledge rather than concentration, and critical reading more than the development of research techniques.

The student is required to complete eight courses at least four of which must be in the 700 to 800 level. His program will be planned with reference to preparation for teaching. He must complete a two-semester sequence entitled "The Teaching of History", and may include three courses in associated disciplines at the discretion of the adviser.

Examinations in foreign languages are not required of students in this program, yet admission to certain courses in the history of non-English speaking countries will necessitate a competence in the relevant language.

Twelve credits is the normal program per semester. The student should expect to complete his program within a six-year period.

Candidates for the degree must pass an oral examination on the student's primary field of interest, to be conducted by an examining committee of three members of the graduate faculty.

Transfer to the regular Master of Arts program may be made with the approval of the department.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS IN HISTORY.

Directed research and writing for qualified students.

Prerequisite, permission of instructor.

Credit, 1-6. Staff.

701. EUROPEAN HISTORIOGRAPHY TO THE ENLIGHTENMENT.

Critical evaluation of the techniques and ideas of major historians and influential schools of historical interpretation from the Greeks through the Renaissance.

Credit, 3. Staff.

702. EUROPEAN HISTORIOGRAPHY, THE ENLIGHTENMENT TO THE PRESENT.

Techniques and ideas of major historians and influential schools of historical interpretation, and the relation of historiography to the intellectual and political history of modern Europe.

Credit, 3. Staff.

703. AMERICAN HISTORIOGRAPHY THROUGH THE CIVIL WAR.

Interpretations of major themes as developed in the works of leading historians.

Credit, 3. Mr. Davis.

704. AMERICAN HISTORIOGRAPHY, 1865 TO THE PRESENT.

Interpretations of major themes as developed in the works of leading historians.

Credit, 3. Staff.

705. PHILOSOPHY OF HISTORY.

The "philosophy of history" both as epistemology and as a method of explanation, and a comparison of the aims of history and the sciences. The course involves an analysis of the nature of history: the difference between truth and fact, the possibility of objectivity, and the theory of historical explanation. Major historians in the field are read, from

Thucydides and Augustine to Croce and Toynbee.

Credit, 3. Mr. Johnston.

706. LATIN AMERICAN HISTORIOGRAPHY.

Techniques and interpretations developed by representative historians from the conquest to the present. Reading knowledge of Spanish or Portuguese required, or permission of instructor.

Credit, 3. Mr. Hanke.

710. TOPICS IN HISTORY.

Readings, discussions, reports.

Credit, 3. Staff.

711. TOPICS IN EARLY MEDIEVAL HISTORY.

Continuity between ancient and medieval civilization.

Prerequisites, working knowledge of Latin and one modern language (German, French, Italian) or permission of instructor.

Credit, 3. Mr. Lewis, Mr. Ware.

712. TOPICS IN THE AGE OF THE RENAISSANCE AND REFORMATION.

European culture between 1400 and 1600. A reading knowledge of a modern European language is generally required.

Credit, 3. Mr. Ilardi, Mrs. Chrisman.

713. TOPICS IN THE AGE OF THE ENLIGHTENMENT.

The movement of ideas in Atlantic civilization during the 18th Century. Study of the mind and writings of representative European and American thinkers with emphasis upon politics, religion, science, literature and the arts.

Credit, 3. Mr. Greenbaum.

714. TOPICS IN TUDOR AND STUART ENGLAND.

Selected aspects of the Tudor age; the interplay of social, economic, intellectual and political factors involved in the Stuart Revolution. Constitutional developments emphasized.

Credit, 3. Mr. Shipley.

715. TOPICS IN RECENT EUROPEAN HISTORY.

Basic developments in diplomatic, political, social and economic history since 1890 with particular emphasis upon organic growth and change.

Credit, 3. Mr. Gordon.

716. TOPICS IN WORLD WAR II
AND AFTERMATH.

Pre-nuclear total war in its military development and its political, economic and social ramifications in modern Western society, followed by a study of the postwar settlements and their effects.

Credit, 3.

717. TOPICS IN THE RECENT
SOCIAL HISTORY OF
EUROPE.

The social changes resulting from the industrialization of Europe since 1815 and their relationship to economic and political developments. The methods and materials needed for effective work in recent social history. A series of short problems illustrating proper utilization of the sources.

Credit, 3. Mr. Gordon.

718. TOPICS IN NINETEENTH
CENTURY INTELLECTUAL
HISTORY.

Selected major currents in European thought since the French Revolution, their origins, development and influence. Reading knowledge of French or German is desirable.

Credit, 3.

719. PROBLEMS IN BRITISH
IMPERIAL HISTORY
SINCE 1783.

Aspects of such general topics as the problems of imperial government after the American Revolution, the Durham Report and the growth of the dominions, the difficulties and effect of implantation of British institutions in Asia and Africa, the lessening of British control and the Statute of Westminster, and the political and economic importance of the Commonwealth in world affairs.

Credit, 3. Mr. Wickwire.

720. TOPICS IN BRITAIN IN THE
NINETEENTH CENTURY.

Central themes and topics. Emphasis on the history of thought in its relation to political, economic and social developments.

Credit, 3. Mr. Hernon.

721. PROBLEMS IN RUSSIAN
HISTORY.

Russia in the 19th and 20th centuries with particular emphasis on Russian and Soviet

historiography. Intensive reading and careful analyses of selected topics.

Credit, 3. Mr. McNeal.

722. TOPICS IN MODERN
SPANISH HISTORY.

Spanish history from the end of the reign of Philip II to the end of the Spanish Civil War.

Credit, 3.

730. TOPICS IN EARLY
AMERICAN HISTORY.

Colonial America from discovery and settlement of the New World through the Federalist era.

Credit, 3. Mr. Bernhard.

731. TOPICS IN THE ERA OF THE
CONFEDERATION AND THE
CONSTITUTION.

The formative years of the American nation; the evolution of federal and state constitutions; basic political issues and conflicts; the pattern of economic and social development.

Credit, 3. Mr. Davis, Mr. Bernhard.

732. TOPICS IN THE
NATIONAL PERIOD.

A reading course. Basic features of American political, social and economic history from the rise of Jeffersonianism to the Civil War.

Credit, 3. Mr. Cantor, Mr. Richards.

733. TOPICS IN THE AMERICAN
CIVIL WAR ERA.

Analysis and interpretation of slavery and abolition, Southern nationalism, the breakdown of national parties, causes of the War, wartime politics and the War's impact.

Credit, 3. Mr. Oates.

734. TOPICS IN THE
GILDED AGE.

Investigation of national re-unification, Grantism, dead center politics, genteel reform, the new industrialism and business leadership, labor and agrarian problems.

Credit, 3. Mr. McFarland.

735. TOPICS IN THE
TWENTIETH CENTURY.

The nature of Progressivism, American involvement in World Wars I and II, the character of recent American politics, and cultural and economic changes since the turn of the century.

Credit, 3. Mr. Quint, Mr. Albertson.

736. TOPICS IN AMERICAN
DIPLOMATIC HISTORY.

Readings in the primary and secondary sources for the study of important phases in American diplomacy. *Credit, 3.* Mr. Hart.

738. TOPICS IN UNITED STATES
INTELLECTUAL HISTORY.

Specific aspects of such general topics as the American adaptation of the European heritage, the growth of the concept of Americanism, the emergence of patrician leadership, the achievement of realistic democracy, the triumph of nationalism, the assertion of individualism in a corporate society, and the scientific-humanistic culture conflict.

Credit, 3. Mr. Quint, Mr. Cantor.

739. TOPICS IN MASSACHU-
SETTS HISTORY.

Development of the Commonwealth and its relationship to regional and national institutions and thought from early colonial times to the present. Abundant primary and secondary source materials. A foundation for further research.

Credit, 3.

745. TOPICS IN CONTEMPORARY
LATIN AMERICAN HISTORY.

Major movements since about 1930 with attention directed to the political, economic, social, and ideological forces contributing to change. A reading knowledge of Spanish or Portuguese is generally required.

Credit, 3. Mr. Potash.

748. TOPICS IN ISLAMIC AND
MODERN MIDDLE EASTERN
HISTORY AND POLITICS.

Readings in primary and secondary sources for the study of important aspects of Islamic and Middle Eastern development.

Prerequisite, permission of instructor.

Credit, 3. Mr. Kirk.

750. RESEARCH SEMINAR IN
HISTORY.

Training in historical research.

Prerequisite, permission of instructor.

Credit, 3. Staff.

751. SEMINAR IN MEDIEVAL
HISTORY.

Training in historical research.

Prerequisite, permission of instructor.

Credit, 3. Mr. Lewis, Mr. Ware.

752. SEMINAR IN RENAISSANCE
AND REFORMATION.

Training in historical research.

Prerequisite, permission of instructor.

Credit, 3 each semester; Total credits, 6.

Mr. Ilardi, Mrs. Chrisman.

753. SEMINAR IN THE
ENLIGHTENMENT.

Training in historical research.

Prerequisite, permission of instructor.

Credit, 3. Mr. Greenbaum.

754. SEMINAR IN EIGHTEENTH
CENTURY BRITAIN.

Training in historical research.

Prerequisite, permission of instructor.

Credit, 3. Mr. Wickwire.

755. SEMINAR IN MODERN
ENGLISH HISTORY.

Research on selected topics, 1890-1940.

Prerequisite, permission of instructor.

Credit, 3. Mr. Hernon.

756. SEMINAR IN MODERN
GERMANY.

Training in historical research.

Prerequisite, permission of instructor.

Credit, 3. Mr. Gordon.

757. SEMINAR IN MODERN
FRANCE.

Training in historical research.

Prerequisite, permission of instructor.

Credit, 3.

758. SEMINAR IN RUSSIAN
HISTORY.

Training in historical research.

Prerequisite, permission of instructor.

Credit, 3. Mr. McNeal.

759. SEMINAR IN EUROPEAN
DIPLOMACY SINCE 1815.

Training in historical research and an introduction to the relationships among European nations in a critical period.

Prerequisite, permission of instructor.

Credit, 3. Mr. Swartz.

761. SEMINAR IN EARLY
AMERICAN HISTORY.

Training in historical research.

Prerequisite, permission of instructor.

Credit, 3. Mr. Bernhard.

762. SEMINAR IN THE AGE OF JACKSONIAN DEMOCRACY.
Training in historical research.
Prerequisite, permission of instructor.
Credit, 3. Mr. Richards.
763. SEMINAR IN THE CIVIL WAR AND RECONSTRUCTION.
Training in historical research.
Prerequisite, permission of instructor.
Credit, 3. Mr. Oates.
764. SEMINAR IN THE WESTWARD MOVEMENT OF THE UNITED STATES.
Training in historical research.
Prerequisite, permission of instructor.
Credit, 3. Mr. DePillis, Mr. Davis.
765. SEMINAR IN THE PROGRESSIVE ERA IN THE UNITED STATES.
Training in historical research.
Prerequisite, permission of instructor.
Credit, 3. Mr. Quint, Mr. Tager.
766. SEMINAR IN THE UNITED STATES BETWEEN THE WORLD WARS.
Training in historical research.
Prerequisite, permission of instructor.
Credit, 3. Mr. Quint, Mr. Albertson.
767. SEMINAR IN AMERICAN DIPLOMATIC HISTORY.
Training in historical research.
Prerequisite, permission of instructor.
Credit, 3. Mr. Hart.
768. SEMINAR IN AMERICAN INTELLECTUAL HISTORY TO THE CIVIL WAR.
Training in historical research.
Prerequisite, permission of instructor.
Credit, 3. Mr. Quint, Mr. Cantor.
769. SEMINAR IN AMERICAN INTELLECTUAL HISTORY SINCE THE CIVIL WAR.
Training in historical research.
Prerequisite, permission of instructor.
Credit, 3. Mr. Quint.
770. SEMINAR IN THE COLONIAL HISTORY OF LATIN AMERICA.
Training in historical research.
Prerequisite, permission of instructor.
Credit, 3. Mr. Hanke.
771. SEMINAR IN ARGENTINE HISTORY.
Training in historical research.
Prerequisite, permission of instructor.
Credit, 3. Mr. Potash.
772. SEMINAR IN MEXICAN HISTORY.
Training in historical research.
Prerequisite, permission of instructor.
Credit, 3. Mr. Potash.
780. SEMINAR IN ISLAMIC AND MODERN MIDDLE EASTERN HISTORY AND POLITICS.
Training in historical research.
Prerequisite, permission of instructor. A reading knowledge of a European language is highly desirable. *Credit, 3. Mr. Kirk.*
800. MASTER'S THESIS.
900. DOCTORAL DISSERTATION.
- COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS
(For either major or minor credit)
- 500 (I). THE ANCIENT WORLD TO 500 B.C.
From the origins of human society to the Greeks' confrontation with the Persian Empire.
3 class hours. *Credit, 3. Mr. Kirk.*
- 501 (II). THE ANCIENT WORLD: PERICLES TO CONSTANTINE.
The successive assertions and breakdowns of leadership in the Greek and Roman worlds.
3 class hours. *Credit, 3. Mr. Kirk.*
- 502 (I). EARLY MIDDLE AGES (300-1100).
Spread of Christianity; pagan and early Christian culture; Germanic kingship; the

Carolingian world; early feudalism; monasticism and ecclesiastical centralization.
3 class hours.

Credit, 3. Mr. Lewis, Mr. Ware.

503 (II). THE LATTER MIDDLE
AGES (1100-1350).

Revival of towns and commerce; the growth and development of the feudal monarchies and ecclesiastical authority; rise of secularism.

3 class hours. *Credit, 3. Mr. Ware.*

505 (I), 506 (II). THE AGE OF
THE RENAISSANCE AND REFORMATION,
1300-1600.

The changes in European thought and institutions during the development of Humanism and the Protestant and Catholic Reformations. Either semester may be elected independently.

3 class hours. *Credit, 3. Mr. Ilardi.*

507 (I). EUROPE IN THE
ENLIGHTENMENT,
1685-1789.

Civilization of Western Europe in the eighteenth century, its social milieu, intellectual setting, institutional forces, religious tendencies, aesthetic contributions and the growth of the revolutionary spirit.

3 class hours. *Credit, 3. Mr. Greenbaum.*

508 (II). THE FRENCH REVOLUTION AND NAPOLEON.

Political change in Europe from the Old Regime and the French Revolution to the fall of Napoleon.

3 class hours. *Credit, 3.*

509 (II). HISTORY OF EUROPE,
1815-1870.

Major developments in the internal and international affairs of the European states from the Congress of Vienna to the Franco-German War.

3 class hours. *Credit, 3. Mr. Rearick.*

510 (I). EUROPE, 1870-1918.

Internal developments of the principal countries; a detailed study of conditions and

diplomacy which led to the World War; military and diplomatic history of the war years.

3 class hours.

Credit, 3. Mr. vanSteenberg, Mr. Levy.

511 (II). EUROPE SINCE 1918.

Major developments in the internal and international affairs of the European states since World War I.

3 class hours.

Credit, 3. Mr. vanSteenberg.

512 (I). EUROPEAN INTELLECTUAL
HISTORY IN THE
NINETEENTH CENTURY.

Chief intellectual currents in Europe; romanticism, liberalism, religious revival, socialism, Darwinism, racism, and mass culture.

3 class hours.

Credit, 3. Mr. Rearick, Mr. Johnston.

513 (II). EUROPEAN INTELLECTUAL
HISTORY IN THE
TWENTIETH CENTURY.

Philosophical, academic, literary, aesthetic, political and popular currents since 1900. Admission by permission of instructor.

3 class hours.

Credit, 3. Mr. Johnston.

514 (I), 515 (II). THE HISTORY
OF RUSSIA.

Political, economic, social and intellectual development of Russia. First semester: Tsarist era; second: Origins of Russian Marxism and the Soviet period. Either semester may be elected independently.

3 class hours.

Credit, 3. Mr. Jones.

516 (I). THE RUSSIAN
REVOLUTION.

Intensive study of the origins, course, and impact of the Bolshevik Revolution.

3 class hours.

Credit, 3. Mr. McNeal.

517 (II). SOVIET RUSSIA.

Major social, political, intellectual developments, and the international relations of Soviet Russia since the Bolshevik Revolution.

3 class hours. *Credit, 3. Mr. McNeal.*

518 (I). EARLY MODERN
GERMANY.

From the end of the Thirty Years' War to the collapse of the Napoleonic hegemony.

3 class hours. *Credit, 3.* Mr. Gordon.

519 (II). THE HISTORY OF
MODERN GERMANY.

The evolution and development of Germany since The Congress of Vienna, with emphasis upon diplomatic, political, military and social-economic trends and problems.

3 class hours. *Credit, 3.* Mr. Gordon.

520 (I). MODERN
SCANDINAVIA.

The major issues of domestic and foreign politics of the states of Northern Europe in the Nineteenth and Twentieth Centuries.

3 class hours. *Credit, 3.* Mr. vanSteenberg.

521 (II). FRANCE SINCE 1789.

Selected formative political crises from 1789 to the present, and their settings in the economic, social, and intellectual life of modern France.

3 class hours. *Credit, 3.* Mr. Rearick.

523 (II). HISTORY OF
SPAIN.

Emergence of the Spanish kingdom; the era of empire; Bourbon Spain; the Republic and its aftermath.

3 class hours. *Credit, 3.*

524 (I), 525 (II). THE DIPLOMATIC
HISTORY OF
EUROPE FROM
1815 TO THE
PRESENT.

A survey of diplomatic relations of European states in the 19th and 20th centuries. The first semester treats diplomatic relations to the outbreak of World War I. The second semester continues from World War I to the present. Either semester may be elected independently.

3 class hours. *Credit, 3.* Mr. Swartz.

527 (I). MILITARY HISTORY
OF MODERN
EUROPE.

Development of European military theory

and practice from the Napoleonic era to the present.

3 class hours. *Credit, 3.* Mr. Gordon.

528 (II). EUROPE IN THE
AGE OF THE
BAROQUE.

Europe from the Wars of the Counter-Reformation to the Glorious Revolution. Civilization of the Baroque in its social, political, economic, religious and intellectual settings.

3 class hours.

Credit, 3. Mr. Greenbaum.

529 (II). SOCIAL HISTORY
OF EARLY MODERN
EUROPE.

The social institutions of Europe as they changed from a system of feudal organization to pre-industrial society, including the evolution of the town to the city, the changing role of the church, the changing role of agrarian life, the development of an intellectual class.

3 class hours.

Credit, 3. Mrs. Chrisman.

530 (II). HISTORY OF
MODERN ITALY.

Survey of modern Italy from the origins of the *Risorgimento* in the eighteenth century to the "opening to the left" of the 1960's, with particular reference to domestic problems after the unification, to Italian foreign policy up to the Second World War, and to the rise and consolidation of fascism.

3 class hours.

Credit, 3. Mr. Sarti.

531 (I), 532 (II). ENGLISH
HISTORY.

Emphasis on economic, social, and cultural influences, as well as on constitutional development. Either semester may be elected independently.

3 class hours.

Credit, 3. Mr. Shipley.

533 (II). MEDIEVAL
ENGLAND.

England from the fifth to the fifteenth century, with particular attention to the Anglo-

Saxon period, the Norman Conquest, and the evolution of government to the accession of the Tudors.

3 class hours. *Credit, 3.* Mr. Ware.

534 (I), 535 (II). TUDOR-
STUART ENG-
LAND 1485-1688.

Selected aspects of the constitutional, social, intellectual, and imperial history of England in this period. Either semester may be elected independently.

3 class hours.

Credit, 3. Mr. Shipley.

536 (I). BRITAIN IN THE
EIGHTEENTH CENTURY.

Selected aspects of social, intellectual, imperial, and constitutional history, including the Acts of Union. Impact of the Industrial and French Revolutions.

3 class hours.

Credit, 3. Mr. Wickwire.

537 (I), 538 (II). MODERN
BRITAIN.

Selected topics on the political, social, and intellectual development of Britain in the nineteenth and twentieth centuries. Either semester may be elected independently.

3 class hours.

Credit, 3. Mr. Hernon.

539 (II). HISTORY OF THE
BRITISH EMPIRE AND
COMMONWEALTH
SINCE 1783.

Evolution of British imperial policy; growth of the Dominions, the Commonwealth, and the dependent Empire; role of the Empire in world politics.

3 class hours. *Credit, 3.* Mr. Wickwire.

601 (II). BRAZIL AND
ARGENTINA IN THE
NINETEENTH AND
TWENTIETH CENTURIES.

The emergence of the major South American states. Particular attention will be paid to political organization and economic change, and in the contemporary period to the growth of nationalism and mass-based political movements.

3 class hours. *Credit, 3.* Mr. Potash.

602 (I). THE HISTORY
OF MEXICO.

Mexico from the end of the eighteenth century to the present. Emphasis will be given to political, economic, and social developments.

3 class hours. *Credit, 3.* Mr. Potash.

603 (I). THE CARIBBEAN.

The Caribbean as a focus of conflict and adjustment from the fifteenth century to the present.

3 class hours.

Credit, 3. Mrs. Loy.

604 (II). HISTORY OF
GRAN COLOMBIA.

Colombia, Venezuela and Ecuador from colonial settlement to the present.

3 class hours.

Credit, 3. Mrs. Loy.

605 (II). HISTORY OF THE
ANDEAN REPUBLICS.

Peru, Bolivia, and Chile from the late colonial period to the present. Emphasis on political, social and economic developments with particular attention to institutions.

3 class hours.

Credit, 3.

616 (I). AMERICAN
COLONIAL HISTORY
TO 1763.

Discovery and exploration; early European settlements; system of political and economic control; religious and intellectual development; Anglo-French rivalry.

3 class hours.

Credit, 3. Mr. Bernhard, Mr. Bell.

617 (II). THE AMERICAN
REVOLUTIONARY ERA.

Coming of the Revolution; War for Independence; evolution of American federalism.

3 class hours.

Credit, 3. Mr. Bernhard, Mr. Bell.

618 (II). THE EARLY
NATIONAL PERIOD,
1789-1828.

Development of the United States in its formative years, emphasizing political, intellectual, and diplomatic factors.

3 class hours. *Credit, 3.* Mr. Bernhard.

619 (I). JACKSONIAN
AMERICA.

Political, economic, and social developments in the period before the Civil War.
3 class hours. *Credit, 3.* Mr. Richards.

620 (I). CIVIL WAR
AND RECONSTRUCTION,
1860-1877.

Conduct of the war; political problems; national reunification.
3 class hours. *Credit, 3.* Mr. Oates.

621 (II). THE GILDED AGE.

The emergence of modern political issues during the final decades of the 19th century. Emphasis on the role of industrialization, corporate consolidation, urban growth, and labor, agrarian and genteel protest.
3 class hours. *Credit, 3.* Mr. McFarland.

624 (I). THE PROGRESSIVE
AGE (1900-1920).

The political response to the changing economic and social conditions in American life.
3 class hours.

Credit, 3. Mr. Thompson, Mr. Tager.

625 (II). THE UNITED STATES
BETWEEN THE WORLD
WARS.

American political, economic and intellectual life between the two World Wars.
3 class hours.

Credit, 3. Mr. Thompson, Mr. Wyman.

626 (I), 627 (II). HISTORY OF
AMERICAN
THOUGHT AND
CULTURE.

The basic strands of American thought and their reflection in American culture. First semester deals with the period before 1865. Either semester may be elected independently.

3 class hours.

Credit, 3. Mr. Quint, Mr. Cantor,
Mr. Boyer, Mr. Nissenbaum.

628 (I). UNITED STATES
CONSTITUTIONAL
HISTORY TO THE
CIVIL WAR.

Origins and development of American con-

stitutionalism from the 17th century to the outbreak of sectional armed conflict.

3 class hours. *Credit, 3.* Mr. Cantor.

629 (II). UNITED STATES
CONSTITUTIONAL
HISTORY FROM THE
CIVIL WAR TO THE
PRESENT.

Evolution of constitutional power in modern America.

3 class hours. *Credit, 3.* Mr. Cantor.

630 (I), 631 (II). SOCIAL
HISTORY OF
THE UNITED
STATES.

The evolving status of individuals and groups and problems of migration, livelihood, urbanization, and social conflict. Either semester may be elected independently.

3 class hours. *Credit, 3.* Mr. DePillis.

632 (I). THE SOUTH IN
AMERICAN HISTORY.

From early settlement to contemporary regional problems.

3 class hours. *Credit, 3.* Mr. Thompson.

633 (II). HISTORY OF
AMERICAN WESTWARD
EXPANSION, 1763-1893.

Advance of settlement from the Appalachians to the Pacific and the influence of the frontier upon social, economic, and political conditions.

3 class hours.

Credit, 3. Mr. Davis, Mr. DePillis.

634 (I), 635 (II). DIPLOMATIC
HISTORY OF THE
UNITED STATES.

Development of American foreign relations, 1776 to the present. Either semester may be elected independently.

3 class hours. *Credit, 3.* Mr. Hart.

636 (II). HISTORY OF THE
AMERICAN LABOR
MOVEMENT.

Evolution of trade unionism in American life from late 18th century origins through

post-Civil War developments to the present. Attention to critical evaluation of changes in labor history.

3 class hours.

Credit, 3.

637 (II). THE CITY IN THE
MODERN UNITED
STATES.

The industrial city and the full-scale urbanization of the modern United States. The effect of city life upon the social, political, and economic institutions of America, with emphasis on the historical origins of the problems of modern urban existence.

3 class hours.

Credit, 3. Mr. Tager.

638 (II). AFRO-AMERICAN
HISTORY.

African background of the black man, origins and progress of slavery in colonial America and the United States, development of Afro-American culture, and distinctive contributions of the black man to United States history.

3 class hours.

Credit, 3.

639 (II). UNITED STATES SINCE
PEARL HARBOR.

Emphasis on political, economic, and social currents since World War II.

3 class hours.

Credit, 3. Mr. Wyman.

640 (I). CIVILIZATION OF ISLAM.

From the "revolutionary idea" of Islam and its conquest of an Arab empire to 18th century decay and the Western challenge.

3 class hours.

Credit, 3. Mr. Kirk.

641 (II). THE MODERN
MIDDLE EAST.

From the impact of 18th century Europe on the Islamic empire to the emergence of 20th century nationalism, and socialism and the decline of Western influence.

3 class hours.

Credit, 3. Mr. Kirk.

642 (II). THE OTTOMAN
EMPIRE.

Ottoman history and institutions from the origins of the state to the proclamation of the Turkish Republic, ca. 1280 to 1923. Emphasis on political, economic, and social history and the problems of westernization.

3 class hours.

Credit, 3.

662 (I), 663 (II). HISTORY OF
JAPAN.

The first semester treats the development of Japan from its origins to the middle of the nineteenth century. The second semester explores Japan's modernization from the middle of the nineteenth century and its response to the western impact. Either semester may be elected independently.

3 class hours.

Credit, 3.

670 (I), 671 (II). HISTORY OF
SCIENCE.

Development of major scientific achievements from antiquity to the present. Emphasis on scientific theory; conceptual developments are treated in philosophical, cultural, sociological and scientific contexts.

Prerequisite, one year of physical science.

3 class hours.

Credit, 3.

Home Economics

GRADUATE FACULTY

Helen G. Canoyer, *Dean of the School of Home Economics and Professor of Home Economics*, B.S., Minnesota, 1925; M.A., 1930; Ph.D., 1940.

Mark H. Bert, *Director of Graduate Studies, Department of Nutrition and Food, and Associate Professor of Nutrition and Food*, B.S., Lima University, Peru, 1939; M.S., 1948; Ph.D., Illinois, 1955.

Roberta A. Collard, *Assistant Professor of Human Development*, B.S., Texas, 1940; Ph.D., Chicago, 1962.

Grace J. Craig, *Assistant Professor of Human Development*, B.A., Massachusetts, 1959; M.S., 1962; Ph.D., 1967.

Verda M. Dale, *Professor of Management and Family Economics*, B.S., Kansas State, 1938; M.S., Cornell, 1950; Ph.D., Michigan State, 1968.

Christine H. Hillman, *Assistant Dean and Professor of Home Economics*, B.S., Western Reserve, 1940; M.S., 1942; Ph.D., 1951.

Marion A. Niederpruem, *Professor of Textiles, Clothing and Environmental*

Arts, B.S., University of New York, Buffalo, 1935; M.S., New York University, 1944; Ph.D., Michigan, 1956.

Ellis G. Olim, *Head of Department and Associate Professor of Human Development*, A.B., Harvard, 1931; M.A., Roosevelt University, 1960; Ph.D., University of Chicago, 1965.

Herbert S. Paston, *Assistant Professor of Environmental Arts*, B.F.A., Philadelphia College of Arts, 1952; M.A., Columbia, 1956; Ph.D., 1970.

Barbara F. Turner, *Assistant Professor of Human Development and Psychology*, A.B., Antioch, 1962; M.A., De Paul University, 1965; Ph.D., Chicago, 1969.

HOME ECONOMICS

A Master of Science degree may be earned through the School of Home Economics by candidates who hold an accredited baccalaureate degree and are accepted under the general regulations of the Graduate School of the University. Emphasis may be selected from the Departments of Nutrition and Food; Textiles, Clothing and Environmental Arts; Home Economics Education; Management and Family Economics; and Human Development.

In general, the baccalaureate degree of the applicant need not be in home economics. However, adequate concentration in studies basic to the areas of emphasis is required, or must be satisfied, before a student can be admitted to candidacy.

Students applying for graduate work in Home Economics Education should have a Bachelor's degree in home economics and supporting disciplines to qualify for graduate work in one of the areas of emphasis listed above. Student's background should include some courses in education and student internship. The candidates for this degree are required to take at least nine credits in one subject matter area of home economics, excluding a problem or a thesis.

Other areas of emphasis require the following prescribed academic backgrounds:

Nutrition and Food — strength in the physical and biological sciences; Textiles, Clothing and Environmental Arts — strength in the social sciences; Management and Family Economics — strength in the social sciences; Human Development — strength in the biological and social sciences. Candidates interested in the latter area, which includes Child Development and Family Life, may wish to avail themselves of the privilege of affiliating at Merrill-Palmer in Detroit. Such students must take at least fifteen credits in residence at the University.

NUTRITION AND FOOD (NF) — *Detailed course descriptions given on Page 224.*

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

421. DEVELOPMENTS IN
NUTRITIONAL EDUCATION. *Credit, 3.*

700. SPECIAL PROBLEMS IN FOOD
OR NUTRITION. *Credit 3-6.*

703. ADVANCED NUTRITION—
METABOLISM OF MAJOR
FOOD STUFFS. *Credit, 3.*

704. ADVANCED NUTRITION—
VITAMINS. *Credit, 3.*

705. ADVANCED NUTRITION—
MINERALS. *Credit, 3.*

710. SEMINAR.
Credit, 1-3. Maximum Credit, 6.

800. MASTER'S THESIS. *Credit, 6-10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

651. INSTITUTIONAL ADMINIS-
TRATION. *Credit, 4.*

652. HUMAN NUTRITION. *Credit, 3.*

660. EXPERIMENTAL FOODS.
Credit, 3.

673. NUTRITION DURING GROWTH AND DEVELOPMENT. *Credit, 3.*

675. NUTRITION IN DISEASE. *Credit, 3.*

TEXTILES, CLOTHING AND ENVIRONMENTAL ARTS (TCEA)
COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS. *Credit, 3-6.*

710. SEMINAR.

Readings, reports and discussions on the current literature in the area of Textiles, Clothing and Environmental Arts.

Credit, 1-3. Maximum Credit, 6.

800. MASTER'S THESIS.

Individual research. *Credit, 6-10.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

553. APPAREL DESIGN II.

Patterns and fitting problems: development and use of master pattern in executing original designs.

One class hour, two 2-hour laboratories.

Prerequisite, TCEA 128, or permission of instructor.

Credit, 3.

576. HISTORY OF DECORATIVE ARTS.

Style periods in their historic contexts with emphasis on developments in furniture and furnishings. Illustrated lectures. Study tours.

Prerequisite, TCEA 123 or permission of instructor.

Credit, 3.

577. HISTORY OF COSTUME.

Western Costume from ancient civilization to the present; exploration of the relationship of clothing to the period. Study tours.

Prerequisite, TCEA 123. *Credit, 3.*

670. TEXTILES II.

Analysis and evaluation of recent scientific and technical developments in fibers and finishes.

Prerequisite, TCEA 124. *Credit, 3.*

678. ADVANCED INTERIOR DESIGN.

Advanced color theory; scale drawing, perspective drawings and renderings; investigation of sources and resources for interior designers and work problems in domestic and commercial interiors. Study tours.

One class hour, four studio hours.

Prerequisite, permission of instructor.

Credit, 3.

HOME ECONOMICS EDUCATION (HEEd.)

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS IN HOME ECONOMICS EDUCATION.

Credit, 3-6.

710. SEMINAR.

Readings, reports and discussions on the current literature in the area of Home Economics Education.

Credit, 1-3. Maximum Credit, 6.

800. MASTER'S THESIS.

Individual research. *Credit, 6-10*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

681. ADULT EDUCATION IN HOME ECONOMICS.

Organization of material, selection, use and evaluation of teaching techniques suited to group work with adolescents and adults. Credit toward meeting state standards for teachers and A.D.A. requirement.

Prerequisite, minimum 6 credits in major area. *Credit, 3.*

682. CURRICULUM AND METHODS IN HOME ECONOMICS.

Organization, scope and sequence of learning experiences in home economics education. Philosophy and content of curriculum, development of resource units, and methods of teaching.

Prerequisites, Psych 601, 563, and Educ 351. *Credit, 4.*

MANAGEMENT AND FAMILY
ECONOMICS (MFE)
COURSES OPEN TO GRADUATE
STUDENTS ONLY

(For either major or minor credit)

430. HOME MANAGEMENT
FOR TODAY'S FAMILIES.

Emphasis on management principles involved in family economics, work simplification, and decision making in the home. For those who work in an advisory capacity with families.

Prerequisite, permission of instructor.

Credit, 3.

700. SPECIAL PROBLEMS IN
MANAGEMENT AND
FAMILY ECONOMICS. *Credit, 3-6.*

710. SEMINAR.

Readings, reports and discussions on the current literature in the area of Family Economics and Home Management.

Credit, 1-3. Maximum Credit, 6.

800. MASTER'S THESIS.

Individual research.

Credit, 6-10.

COURSES OPEN TO BOTH
GRADUATE AND UNDER-
GRADUATE STUDENTS

(For either major or minor credit)

550. FAMILY MANAGEMENT
AND DECISION MAKING.

The integrated nature of management in the family; concerns values and goals as reflected in decision making about family resources.

Prerequisite, permission of instructor.

Credit, 3.

575. PERSONAL AND
FAMILY ECONOMICS.

Analyzing financial problems and alternatives available to individuals and families under changing conditions. Exploring aspects of financial institutions affecting people in our economic society.

Prerequisite, Econ 125 or permission of instructor.

Credit, 3.

HUMAN DEVELOPMENT (HD) —

Detailed course descriptions given on page 183

COURSES OPEN TO GRADUATE
STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS IN
HUMAN DEVELOPMENT.

Credit, 3-6.

710 SEMINAR.

Credit, 1-3.

800. MASTER'S THESIS.

Credit, 6-10.

COURSES OPEN TO BOTH
GRADUATE AND UNDER-
GRADUATE STUDENTS

(For either major or minor credit)

570. CHILD DEVELOPMENT.

Credit, 3.

572. DIRECTED NURSERY
SCHOOL OBSERVATION.

Credit, 3.

610. LANGUAGE AND
COGNITIVE DEVELOPMENT.

Credit, 3.

650. RESEARCH METHODS IN
HUMAN DEVELOPMENT.

Credit, 3.

660. THEORIES OF
HUMAN DEVELOPMENT.

Credit, 3.

670. HUMAN DEVELOPMENT
IN ADULTHOOD.

Credit, 3.

681. LABORATORY SCHOOL
MANAGEMENT (I).

Credit, 3.

682. PHILOSOPHY AND
THEORIES OF EARLY
CHILDHOOD EDUCATION.

Credit, 3.

Human Development

GRADUATE FACULTY

Ellis G. Olim, *Head of the Department and Associate Professor of Human Development*, A.B., Harvard, 1931; M.A., Roosevelt University, 1960; Ph.D., University of Chicago, 1965.

Roberta A. Collard, *Assistant Professor of Human Development*, B.S., Texas, 1940; Ph.D., University of Chicago, 1962.

Grace J. Craig, *Assistant Professor of Human Development*, B.A., University of Massachusetts, 1959; M.S., 1962; Ph.D., 1967.

Barbara F. Turner, *Assistant Professor of Human Development and Psychology*, A.B., Antioch, 1962; M.A., DePauw University, 1965; Ph.D., University of Chicago, 1969.

A Master of Science degree may be earned in the School of Home Economics with an emphasis in Human Development by candidates who hold an accredited baccalaureate degree and are accepted under the general regulations of the Graduate School of the University. The baccalaureate degree of the applicant need not be in Human Development, nor in any related area such as Child Development, Psychology, Sociology, or Education. However, adequate concentration in the social sciences is required.

Applicants are required to submit Graduate Record Examination scores in verbal and quantitative ability and their score on the Miller Analogies Test.

Human Development includes options for the student to specialize in Child Development, Adult Development, Aging, and Early Childhood Education. The Department operates a Laboratory School and students may elect to qualify for an elementary school teaching certificate in Massachusetts.

Thirty credits must be earned: at least 24 of these must be in courses in the major or closely related fields, and at least 6 credits must consist of a thesis involving research.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS IN HUMAN DEVELOPMENT.

Credit, 3-6.

710. SEMINAR.

Readings, reports and discussions on the current literature in the area of Human Development.

Credit, 1-3.

800. MASTER'S THESIS.

Individual research.

Credit, 6-10.

COURSES OPEN TO BOTH GRADUATE AND UNDER-GRADUATE STUDENTS

(For either major or minor credit)

570. CHILD DEVELOPMENT.

The child from the development point of view. Emphasis on interaction of heredity and environment on development.

Prerequisites, Soc 101, Psych 101, or permission of instructor.

Credit, 3.

572. DIRECTED NURSERY SCHOOL OBSERVATION.

Directed experience in observation techniques with laboratory school children.

Prerequisite, HD 570 or equivalent.

Credit, 3.

610. LANGUAGE AND COGNITIVE DEVELOPMENT.

Language and cognition from the developmental point of view. Emphasis is on the relationship between language and thought and changes in the relationship in the course of cognitive growth.

Prerequisite, HD 570 or equivalent.

Credit, 3.

650. RESEARCH METHODS IN HUMAN DEVELOPMENT.

Methods and techniques for studying developmental processes at various stages of the life span, from infancy to old age.

Prerequisite, HD 570 or equivalent, or may be taken concurrently with HD 570.

Credit, 3.

660. THEORIES OF HUMAN DEVELOPMENT.

The major theories that have been devised to explain human development. Emphasis on psychological theories and concepts. The relevance and relationship of biological, social and anthropological concepts are also covered.

Prerequisite, HD 570 or equivalent.

Credit, 3.

670. HUMAN DEVELOPMENT IN
ADULTHOOD.

Human development from young adulthood through old age. A social psychological perspective of change across the adult life span. Prerequisite, HD 570 or equivalent, or permission of instructor. *Credit, 3.*

681. LABORATORY SCHOOL
MANAGEMENT.

Principles and methods of early childhood education. Includes teaching methods and curriculum planning for two- to five-year-old children.

Prerequisite, HD 570 or equivalent.

Credit, 3.

682. PHILOSOPHY AND THEORIES
OF EARLY CHILDHOOD
EDUCATION.

Philosophy, theories, and history of early childhood education. Field trips.

Prerequisite, HD 681 or permission of instructor.

Credit, 3.

683. STUDENT TEACHING IN
THE LABORATORY SCHOOL.

Students plan, direct, and teach curriculum in the laboratory school under staff supervision.

Prerequisite, 570 or permission of instructor.

Credit, 3.

684. INTERNSHIP IN A CHILD-
SERVING PROFESSION.

Teaching or work with normal or exceptional children, Headstart children, or the emotionally disturbed.

Prerequisite, 570 or permission of instructor.

Credit, 3.

Industrial Engineering and Operations Research

GRADUATE FACULTY

Richard W. Trueswell, *Head of the Department and Professor of Industrial Engineering*, M.E., Stevens Institute of Technology, 1952; M.S.I.E., 1958; Ph.D., Northwestern, 1964.

Joseph L. Balintfy, *Professor of General*

Business and Finance, B.S., Illinois Institute of Technology, 1961; M.B.A., Northwestern University, 1963; Ph.D., 1967.

Robert D. Davis, *Associate Professor of Industrial Engineering*, B.S., Trinity College, 1956; Ph.D., Northwestern, 1968.

Richard J. Giglio, *Associate Professor of Industrial Engineering*, B.S., Massachusetts Institute of Technology, 1959; M.S., Stanford, 1964; Ph.D., 1966.

Frank C. Kaminsky, *Associate Professor of Industrial Engineering*, B.S., University of Connecticut, 1961; M.S., Northwestern, 1964; Ph.D., 1965.

Stanley Lippert, *Associate Professor of Industrial Engineering*, B.A., University of California, Los Angeles, 1935.

Hugh J. Miser, *Professor of Industrial Engineering*, B.S., Vanderbilt, 1938; M.A., Armour Institute of Technology, 1940; Ph.D., Ohio State, 1946.

Colin L. Moodie, *Visiting Associate Professor of Industrial Engineering*, B.S., University of Massachusetts, 1954; M.B.A., Western New England College, 1960; M.S.I.E., Purdue University, 1961; Ph.D., Purdue University, 1964.

Robert F. Rikkers, *Associate Professor of Industrial Engineering*, B.S., Grinnell College, 1961; M.S., Northwestern, 1964; Ph.D., 1965.

Edward J. Rising, *Professor of Industrial Engineering*, B.M.E., Rensselaer Polytechnic Institute, 1950; M.M.E., Syracuse University, 1954; Ph.D., State University of Iowa, 1959.

INDUSTRIAL ENGINEERING AND OPERATIONS RESEARCH

The graduate program in industrial engineering is designed to emphasize the modern and analytical aspects of industrial engineering. Emphasis is placed on operations research theory and applications although not to the exclusion of traditional industrial engineering.

A Ph.D. in industrial engineering is offered with the major areas of operations research, and manufacturing and produc-

tion. Minor areas of specialization are possible within the department in data processing and information handling systems and in other areas outside the department such as computer science, business administration, engineering (all majors), statistics, economics, and mathematics. The requirements for the Ph.D. degree are essentially as described in this catalog under general requirements for the Ph.D. degree.

A master's thesis is optional. If no thesis is written, a special project must be completed bringing the minimum total number of credits required to 33 rather than 30 as under the thesis program.

The department requires no foreign language reading competency for the doctoral degree.

Additional information may be obtained by writing to the Head of the Department.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS IN INDUSTRIAL ENGINEERING.

Special investigational or research problems in Industrial Engineering, the scope to be varied to meet specific conditions.

Prerequisite as required by the problem.

Credit, 1-6.

701. INDUSTRIAL ENGINEERING.

A history and review of the growth and development of Industrial Engineering and scientific management. The origins of the present day work in operations research, management science, automation, electronic data processing, computers, and systems design will also be traced. Required course for all graduate students in Industrial Engineering regardless of background.

Credit, 0.

720. ADVANCED TOPICS IN OPERATIONS RESEARCH I.

Rigorous theory of linear programming. Includes formulation of linear programming

models, simplex, revised simplex and dual simplex algorithms, duality, parametric procedures, interpretation of results and the decomposition principle.

Credit, 3.

722. ADVANCED TOPICS IN OPERATIONS RESEARCH II.

An extension of IE 720. Topics include the theory and application of generalized linear programming, the cutting stock problem, primal-dual algorithms, the relationship between games and linear programs, upper bound constraints, network problems, and fractional linear programs.

Prerequisite, IE 720.

Credit, 3.

724. NON-LINEAR AND DISCRETE PROGRAMMING.

Applications and solution techniques for discrete programs; cutting plane, branch and bound, and heuristic algorithms; Kuhn-Tucker theory, quadratic programming, separable programming and gradient techniques.

Prerequisite, IE 720.

Credit, 3.

726. OPERATIONS RESEARCH APPLICATION.

Application of the principles of operations research to a variety of decision-making problems. Case problems drawn from the literature, instructor's background and local industry.

Prerequisites, IE 680, 720 (concurrent).

Credit, 3.

728. RECENT DEVELOPMENTS IN MATHEMATICAL PROGRAMMING.

In-depth study of the theory and/or application of recent developments in mathematical programming. Topics selected from the current literature.

Prerequisites, IE 722 and 724.

Credit, 3.

751. DESIGN FOR PRODUCTION.

The theoretical and practical factors that make for optimization of product and equipment design. Effective use of equipment, jigs, and fixtures. Introduction to numerically controlled machines.

Credit, 3.

752. MECHANIZATION AND AUTOMATION.

Application of mechanization and automation techniques of industrial processes. Limitations and capabilities of numerically controlled machine tools and processes.

Credit, 3.

753. METHODS OF MEASUREMENT OF HUMAN WORK.

A critical study of the assumptions in measuring human effort in industry including the problems present in rating, predetermined data systems, the use of the high speed camera in securing data.

Prerequisites, IE 561 and 572. *Credit, 3.*

754. ADVANCED TOPICS IN ENGINEERING ECONOMY.

A more intensive study of the basic subject field of engineering economy as stated in IE 354, 654.

Prerequisite, IE 654. *Credit, 3.*

755. QUALITY CONTROL AND RELIABILITY ENGINEERING.

Current theory and practice in the area of system and product quality control and reliability. Currently used methods in these areas are critically studied and evaluated.

Prerequisite, IE 572. *Credit, 3.*

756. ADVANCED TOPICS IN DATA PROCESSING.

Probability theory and information theory, components and operation of analog and digital computers, the analysis of large scale data processing systems as applied to the functioning of industrial control systems.

Prerequisite, IE 556. *Credit, 3.*

757. HUMAN FACTORS DESIGN ENGINEERING.

Design of machinery, products, and systems for optimal functional use based on the principles of engineering design and human engineering. Stress on physiological rather than psychological factors.

Prerequisite, IE 561. *Credit, 3.*

758. DESIGN OF CLOSELY CONFINED MANNED OPERATIONS STATIONS (OE 781).

Introductory anatomy and physiology; res-

piration, effects of various air composition and pressures on efficiency, console design, anthropometry, work place layout; design of controls, psychological and physiological effects of work in confined spaces; system design and allocation of function.

Three class hours, one 2-hour laboratory per week.

Prerequisite, IE 757 or permission of instructor. *Credit, 4.*

761. DATA PROCESSING SYSTEMS ANALYSIS AND DESIGN.

Analysis and design of small, medium, and large scale electronic data processing systems. Real-time systems applications currently in use and proposed in the data processing areas as opposed to the scientific areas. Electronic data processing systems and their effect on industrial and other organizations.

Credit, 3.

762. COMPUTER METHODS FOR OR/MS APPLICATIONS.

The uses of computers for the solving of operations research/management sciences problems. Special languages are studied and applied to these problems. Comparisons between real-time, batched, and simulation approaches.

Prerequisite, IE 680. *Credit, 3.*

763. INFORMATION SCIENCE AND TECHNOLOGY.

The information searching tools and techniques available to scientific and industrial organizations. Individual and group behavior in using these techniques. Critical analyses of information searching and retrieval systems, both manual and automated.

Credit, 3.

777. MANUFACTURING CONTROL.

A quantitative approach to decision making in production management. Incremental analysis, linear programming, waiting line theory, statistics as applied to problems of economic quantity planning, production programming, statistical control, and equipment purchase.

Prerequisites, basic knowledge of statistics, principles of operations research, and an elementary course in the field. *Credit, 3.*

783. SIMULATION AND MONTE CARLO TECHNIQUES.

Theory and application of simulation to the problems of operations research. Facilities of the Research Computing Center are utilized for the development and testing of models prepared in this course. Prerequisites, IE 572 and 573. *Credit, 3.*

784. STOCHASTIC PROCESSES IN INDUSTRIAL ENGINEERING I.

Application and theory of stochastic processes with primary emphasis on Markovian processes. Applications in inventory control, maintenance, and queuing theory. Prerequisite, IE 571. *Credit, 3.*

785. STOCHASTIC PROCESSES IN INDUSTRIAL ENGINEERING II.

Continuation of IE 784; the study of Markov processes. Included are non-Markovian processes, regenerative stochastic processes, and imbedded Markov processes. Both theory and applications. Prerequisite, IE 784. *Credit, 3.*

786. DECISION ANALYSIS.

Decision problems involving the choice between alternatives when uncertainty is present. Emphasis on the practical applications of this method, rather than on the more abstract theory. Topics include the structure of a Decision Analysis problem, the assignment of necessary probabilities, and the assessment of the decision maker's value structure. *Credit, 3.*

791. SEMINAR IN OPERATIONS RESEARCH.

Current applications, research activities, and research problems in operations research. Advanced Master's and Ph.D. students only. *Credit, 3.*

792. SEMINAR IN MANUFACTURING AND PRODUCTION.

Current application, research activities, and research problems in manufacturing and production. Advanced Master's and Ph.D. students only. *Credit, 3.*

793. SEMINAR IN DATA PROCESSING AND INFORMATION HANDLING SYSTEMS.

Current applications, research activities and

research problems in information handling and data processing systems. Advanced Master's and Ph.D. students only. *Credit, 3.*

800. MASTER'S THESIS.

Credit, 6.

900. DOCTORAL DISSERTATION.

COURSES OPEN TO BOTH GRADUATE AND UNDER-GRADUATE STUDENTS
(For either major or minor credit)

553. METHODS AND STANDARDS ENGINEERING.

The principles involved in the simplification of the work pattern and the design of the work place, and in the establishment of production standards.

Three class hours, one 3-hour laboratory period.

Prerequisite, IE 271, previously or concurrently. *Credit, 4.*

556. DATA PROCESSING AND INFORMATION HANDLING SYSTEMS.

Principles and applications of data processing and electronic computer systems for use by Industrial Engineers as a management tool for control and decision making.

Prerequisite, permission of instructor.

Credit, 3.

641. HOSPITAL INDUSTRIAL ENGINEERING I.

An introductory course in the application of Industrial Engineering techniques to hospital management. Emphasis on the institution of Industrial Engineering programs in hospitals and the choice of suitable projects. Guest lecturers. *Credit, 3.*

642. HOSPITAL INDUSTRIAL ENGINEERING II.

A projects course based upon material covered in IE 641. A study is first made of previous Industrial Engineering projects in hospitals and then each student will conduct a project of his own in a local hospital.

Prerequisite, IE 641.

Credit, 3.

660. SAFETY ENGINEERING.

Design of equipment facilities and processes to minimize accidents. Evaluation and design of fire prevention equipment and accident control procedures in organizations.

Credit, 2.

675. JOB EVALUATION.

The principles used to determine an evaluation of all occupations in order to establish an equitable rating between them, to establish sound wage and salary policies.

Prerequisite, IE 151.

Credit, 2.

676. TIME STUDY.

The principles involved in the establishment of production standards and their application in the management functions of cost accounting, estimating, production control incentives, budgetary control.

Prerequisite, IE 151 concurrently except for Business Administration majors.

Credit, 3.

677. LAYOUT AND DESIGN OF ORGANIZATIONAL FACILITIES.

The principles applying to the determination and development of the physical relationship between plant equipment and operators considering the economy and effectiveness of operation.

One class hour, one 3-hour laboratory period.

Prerequisites, ME 102, and IE 151, or equivalents.

Credit, 2.

682. WORK SIMPLIFICATION.

The principles involved in the simplification of means of doing work and in the application and use of these principles.

One class hour, one 3-hour laboratory period.

Prerequisites, ME 568, and IE 676 concurrently.

Credit, 2.

COURSES NOT FOR MAJOR CREDIT

560. DESIGN OF MAN-MACHINE SYSTEMS I.

The capabilities and limitations of both men and machines are taught as a background to the practical design of integrated man-machine systems. Major topics are plant layout, human factors engineering, methods and standards engineering and systems synthesis.

Prerequisite, permission of instructor.

Credit, 3.

561. DESIGN OF MAN-MACHINE SYSTEMS II.

Continuation of IE 560.

Prerequisite, IE 560.

Credit, 3.

571. BASIC PROBABILITY FOR ENGINEERS.

Probability theory including: sample spaces; discrete and continuous random variables; functions of random variables; marginal, conditional and joint probability, density and cumulative distribution functions; and moments.

Prerequisite, Math 124.

Credit, 3.

572. PRINCIPLES OF ENGINEERING STATISTICS.

Statistical principles as applied to engineering problems including hypothesis testing, estimation, analysis of variance, design of experiments, sampling plans, statistical quality control.

Prerequisite, IE 571.

Credit, 3.

573. INTRODUCTION TO SIMULATION METHODS (Also listed as GB 573).

Introduction to the principles and methods of computer simulation. Each student is expected to construct, test, and run a complex simulation model.

Prerequisite, IE 571.

Credit, 3.

653, 654. INDUSTRIAL ENGINEERING ECONOMICS I-II.

An introduction to economic problems faced by the industrial engineer: comparison of alternatives in engineering projects, break-even and minimum cost points, and economic selection and replacement of structures and machines. Decisions made in the face of risk and uncertainty discussed extensively. Instruction done wherever advantageous by the case method. Either course may be taken separately.

Prerequisite, IE 572.

Credit, 3 each semester.

678. PRODUCTION PLANNING AND CONTROL.

The principles and methods used to regulate production activities in keeping with the manufacturing plan.

Prerequisites; IE 151, 572, 680.

Credit, 3.

679. OPERATIONS RESEARCH I.

Deterministic models: classical optimization, linear programming, dynamic programming, search techniques, and combinatorial problems. Credit not allowed students who have taken Management 253, 254. *Credit, 3.*

680. OPERATIONS RESEARCH II.

Stochastic models: decision theory, game theory, queueing theory, inventory theory, and Markov processes. Credit not allowed students who have taken Management 253, 254.

Prerequisites, IE 571, 679. *Credit, 3.*

Italian

(See Department of French for Graduate Faculty).

COURSES OPEN TO BOTH GRADUATE AND UNDER- GRADUATE STUDENTS

550. ITALIAN CIVILIZATION.

The historical, literary, philosophic and artistic aspects of Italian civilization, aimed at an understanding of Italian life and culture. *Credit, 3.*

601, 602. DANTE AND THE DUECENTO.

Selections from the works of Dante and his contemporaries culminating in an intensive study of the Divine Comedy. *Credit, 3.*

610. THE RENAISSANCE.

Literature of the 14th and 15th Centuries: Petrarca, Boccaccio, Poliziano, Alberti, Sacchetti. *Credit, 3.*

615. THE HIGH RENAISSANCE.

Literature of the late 15th and 16th Centuries: Machiavelli, Castiglione, Ariosto, Tasso. *Credit, 3.*

630. ITALIAN LITERATURE OF THE EIGHTEENTH CENTURY.

Significant currents and authors from Goldoni to Alfieri. *Credit, 3.*

635. NEO-CLASSICISM AND ROMANTICISM.

Intensive study of the works of Foscolo, Leopardi, and Manzoni. *Credit, 3.*

640. MODERN THEATER.

Italian theater from Verga to the present. *Credit, 3.*

645. MODERN POETRY.

Italian poetry from Carducci to the present with emphasis on hermetism. *Credit, 3.*

650. MODERN ITALIAN NOVEL.

Development of the novel from Verga to the present. *Credit, 3.*

690. SEMINAR IN ITALIAN LITERATURE.

Italian literature for advanced students. Subject of the seminar is announced the preceding semester. *Credit, 3.*

Labor Studies

GRADUATE FACULTY

Ben B. Seligman, *Director and Professor of Economics*, A.B., Brooklyn College, 1934.

J. R. Beattie, *Associate Director of the Cooperative Extension Service*, B.S., New Hampshire, 1939; M.S., 1940.

John L. Blackman, Jr., *Associate Professor of Economics*, B.A., Haverford College, 1930; M.A., Harvard, 1948; Ph.D., 1957.

John T. Conlon, *Associate Dean of Business Administration and Professor of Management*, B.B.A., Massachusetts, 1949; M.A., Connecticut, 1951; Ph.D., Michigan State, 1960.

Arthur C. Gentile, *Associate Dean of the Graduate School and Professor of Botany*, B.S., College of the City of New York, 1948; M.S., Brown, 1951; Ph.D., Chicago, 1953.

Hilda H. Golden, *Associate Professor of Sociology*, A.B., Skidmore, 1942; M.A., Duke, 1944; Ph.D., 1950.

David A. Gugin, *Assistant Dean of Administration and Assistant Professor of Government*, B.A., University of South Dakota, 1961; M.S., University of Michigan, 1964; Ph.D., 1967.

Bruce R. Morris, *Professor of Economics*, A.B., Western Reserve, 1931; M.A., Ohio State, 1932; Ph.D., Illinois, 1937.

Stanley M. Moss, *Assistant Head of Department of Psychology and Associate Professor of Psychology*, B.S., Ohio State, 1957; M.S., 1958; Ph.D., 1962.

Howard H. Quint, *Professor of History*, B.A., Yale, 1940; M.A., Stanford, 1942; Ph.D., Johns Hopkins, 1947.

Richard W. Trueswell, *Associate Professor of Industrial Engineering*, B.S.M.E., Stevens Institute of Technology, 1952; M.S.I.E., 1958; Ph.D., Northwestern, 1964.

Harold Wolozin, *Professor of Economics*, University of Massachusetts at Boston, B.A., Tufts, 1942; Ph.D., Columbia, 1955.

LABOR STUDIES

Students admitted to the M.S. in Labor Studies program must meet the admission requirements of the Graduate School. An undergraduate major in a social science or in Business Administration is a normal prerequisite to admission. Applicants for admission should ordinarily have completed introductory college courses in Principles of Economics, Labor Economics or Labor Problems, Statistics, and Sociology or Psychology. Students may be admitted who are deficient in one or more of these courses but such students will be required to remove any deficiencies without credit toward the M.S. degree. College level courses that would be helpful, although not required, include Industrial Relations, Government, and Industrial Engineering.

Students will be required to take the following courses in order to qualify for this degree:

Bus. Ad. 751. Principles and Policies of Administration

Econ 744. Labor Statistics

History 636. History of the American Labor Movement

Econ 743. Wage Theory and Wage Relationships

Econ 741. Collective Bargaining

Econ 747. Manpower Economics

Labor Rel. 710. Seminar in Labor Relations

Labor Rel. 700. Practicum in Labor Research

One graduate course in the 500, 600 or 700 series in Psychology, Gov 624, Sociology and/or Industrial Engineering, approved by the Director.

In addition, students will be required to choose four electives, at least one of which must be selected from Labor Rel: 764, Econ 742, 745, 641, 746, SBA 760 and SBA 762.

LABOR RELATIONS AND RESEARCH CENTER

700. PRACTICUM IN LABOR RESEARCH, I and II*.

Practical experience in empirical research problems gained by assignment to ongoing projects conducted by the Center. Periodic seminars on methodology.

*Required course.

Credit, 6. Mr. Brooke.

710. SEMINAR IN LABOR RELATIONS.*

Current critical issues in the labor field, such as automation, "unemployment pockets", racial integration in unions. Based upon historical perspective, selected research and field work. A paper is required.

*Required course. *Credit, 3.* Mr. Seligman.

764. THE GOVERNMENT OF UNIONS.

The organization and structure of unions, management of union activity including health and welfare funds, pension plans, budgets, and financial controls. Prerequisite, Econ 541.

Credit, 3. Mr. Friedman.

777. LABOR RELATIONS IN THE PUBLIC SECTOR.

Labor relations in public education, municipal workers, hospital employees and other governmental employees at Federal, state and local levels. Special attention to statutory requirements.

Credit, 3. Mr. Friedman.

SCHOOL OF BUSINESS ADMINISTRATION

564. WAGE AND SALARY ADMINISTRATION.

The objectives, procedures, and problems involved in the establishment and administration of operative and executive compensation plans. *Credit, 3.*

566. MANAGEMENT AND UNION RELATIONS II.

The human relations problems encountered in the interpretation and administration of collective bargaining agreements. Prerequisite, Management 565. *Credit, 3.*

751. PRINCIPLES AND POLICIES OF ADMINISTRATION.*

An advanced course in the Theory of Business Administration, including the generic functions of management, organization theory, and systematic corporate decision making.

*Required course. *Credit, 3.*

761. SEMINAR IN PERSONNEL MANAGEMENT.

Analysis of current practices and major problems of personnel administration through the use of the case method and role playing techniques.

Prerequisite, Management 214. *Credit, 3.*

762. MANAGEMENT OF INDUS- TRIAL RELATIONS.

Organization and administration of the industrial relations function within business firms, with special emphasis on alternative approaches to management rights and responsibilities in Labor Relations. *Credit, 3.*

736. SEMINAR IN INDUSTRIAL RELATIONS.

Analysis of the major current problems encountered by business management in the negotiation and administration of labor relations agreements. A major research study is required.

Prerequisite, Management 565. *Credit, 3.*

892. LEGAL ASPECTS OF INDUSTRIAL AND LABOR RELATIONS.

The historical evolution of national labor

policy from its English origin in 1349 through modern experiences. Common law, statutory and constitutional developments of labor policy are examined against an historical, political and economic background.

Credit, 3.

DEPARTMENT OF ECONOMICS

541. LABOR PROBLEMS.

Background of the labor movement and problems involved in the management-labor relationship and the efforts of management, unions, and government to solve them.

Credit, 3.

542. LABOR LAW AND LEGISLATION.

Economic effects and historical survey of Federal and State laws and an analysis of important court decisions.

Prerequisite, Econ 541. *Credit, 3.*

641. ECONOMIC SECURITY.

Appraisal of insecurity and the methods for meeting it, including a survey of existing social security legislation. *Credit, 3.*

662. TECHNOLOGY IN WESTERN CIVILIZATION.

Origins and impact of the industrial revolution and technological changes on work and society. Social and economic effects of automation. *Credit, 3.*

711. ECONOMIC PLANNING.

Various kinds of economic plans in effect or proposed. Appraisal of the techniques of economic planning. *Credit, 3.*

741. COLLECTIVE BARGAINING.*

The legal background of collective bargaining, the process, subject matter, and problems involved. Individual case problems.

Prerequisite, Econ 541. *Credit, 3.*

*Required course.

742. LABOR THEORY AND IDEOLOGY.

Evolution of theories explaining the nature of the labor movement. European antecedents and the impact of European ideology. Relevant social and economic thought in America.

Prerequisite, Econ 541. *Credit, 3.*

743. WAGE THEORY AND WAGE RELATIONSHIPS.*

Theoretical and institutional study of theories of wages and wage structure.

Prerequisite, Econ 541.

Credit, 3.

*Required course.

744. LABOR STATISTICS.*

A critical analysis of the methodology, techniques of data gathering, and interpretation and use of current statistical series employed in manpower analysis: employment and unemployment, prices, wages, productivity, and related areas.

Prerequisites, statistics and Econ 541.

*Required course.

Credit, 3.

745. LABOR DISPUTE SETTLEMENT.

Ways of settling labor disputes, including grievance proceedings, arbitrations, and presidential intervention.

Prerequisite, Econ 541.

Credit, 3.

746. COMPARATIVE LABOR MOVEMENTS.

Labor movements in various countries with an analysis of their similarities and differences.

Prerequisites, History 636 and Econ 541.

Credit, 3.

747. MANPOWER ECONOMICS.*

A critical examination of current manpower policies and problems. The quantity and quality of manpower resources, problems of labor, mobility, adjustment policies and research tools are reviewed.

Credit, 3.

*Required course.

801. HISTORY OF ECONOMIC THOUGHT.

Treatment in depth of various topics within the history of economic thought.

Prerequisite, Econ 306 or permission of instructor.

Credit, 3.

DEPARTMENT OF PSYCHOLOGY

580. SOCIAL PSYCHOLOGY.

An introduction to the principles and study of social behavior. A general consideration of the psychological factors involved in attitude formation and change, communication

and persuasion, and small group processes. Not for Psychology majors.

Prerequisite, Psychology 101 or 105.

Credit, 3.

590. INDUSTRIAL PSYCHOLOGY.

Psychological principles, underlying personnel selection and training, communication and decision-making in industry.

Prerequisite, Psychology 101.

Credit, 3.

661. PSYCHOLOGY OF OCCUPATIONS.

Interests, abilities, and attitudes related to occupational selection, proficiency, and satisfaction. Psychological techniques fundamental to occupational research are emphasized.

Prerequisite, Psychology 311.

Credit, 3.

DEPARTMENT OF SOCIOLOGY.

551. URBAN SOCIOLOGY.

A comparative analysis of cities and urbanization with special reference to demographic characteristics of urban populations, urban ecology, and urban social structure.

Credit, 3.

556. RACE RELATIONS.

Social, economic, and political aspects of racial problems in the U.S., with particular reference to the Negro and major ethnic groups. Problems resulting from contact of races in Asia, Africa, and South America.

Credit, 3.

575. SOCIAL PROBLEMS.

Incidence, distribution, and interrelations among the major types of social tensions in human societies. Research projects and field trips required.

Credit, 3.

592. INTRODUCTION TO SOCIAL WELFARE.

Examination of the relationship between welfare, as a social institution, and the socio-cultural environment and other social institutions of the society in which it exists.

Credit, 3.

731. SOCIAL GERONTOLOGY.

Implications of aging for society and the individual. Position of the aged in non-industrialized and industrialized societies.

Changing roles of older people in the American family and the community.

Prerequisite, Soc 257 or permission of instructor. *Credit, 3.*

759. SOCIAL STRATIFICATION.

The major contemporary writers and their contribution to this area. Research techniques in the analysis of social class and social mobility are examined.

Prerequisite, Soc 259 or equivalent, or permission of instructor. *Credit, 3.*

785. COMPLEX ORGANIZATIONS.

A survey of major theories of organization, with emphasis on recent findings on the determinants of individual behavior and organizational effectiveness. *Credit, 3.*

DEPARTMENT OF GOVERNMENT

572. PUBLIC ADMINISTRATION.

Organization and management in modern government, with emphasis on the bureaucracy's role in public policy formation. *Credit, 3.*

575. COMPARATIVE PUBLIC POLICY.

A comparative analysis of policy formation: the process of social and economic policy decision-making in selected industrial societies; the interaction of institutions, ideas, and power in decisions concerning social welfare, economic planning, and related policy areas. *Credit, 3.*

576. POLITICAL THEORY, IDEOLOGY, AND PUBLIC POLICY.

The evaluation of social policy: a consideration of some of the normative issues raised in controversies over selected cases of social and economic policy in the light of the main traditions of Western political thought and of recent work on the logical and ethical aspects of social choice. *Credit, 3.*

590. CONSTITUTIONAL LAW.

The United States Constitution as interpreted by decisions of the Supreme Court. *Credit, 3.*

591. CIVIL LIBERTIES.

Development in American Constitutional

Law of the concept of civil liberty, including the following fields: free speech and religion, fair trial, and race discrimination. The function of courts in the safeguarding of these liberties. *Credit, 3.*

622. THE LEGISLATIVE PROCESS.

The role of the legislature in national and state government. The functions of legislatures; legislative procedures; the role played by political parties and pressure groups in the legislative process. Emphasis on research. *Credit, 3.*

624. METROPOLITAN POLITICS.

Problems of metropolitan areas from the standpoint of the actual and possible political approaches to their solution. Includes the role of parties, development of political leadership, existing political institutions, pressure group activity and other relevant political phenomena. *Credit, 3.*

690. SEMINAR IN PUBLIC LAW.

Selected topics in public law. Prerequisite, Gov 590 or 591, or equivalent. *Credit, 3.*

719. POLITICS AND THE LEGISLATIVE PROCESS.

Selected topics relating to American Politics, political parties, elections and the legislative process. Prerequisite, Gov 518 or equivalent. *Credit, 3.*

DEPARTMENT OF HISTORY

624. THE PROGRESSIVE AGE, 1900-1920.

The political response to the changing economic and social conditions in American life. *Credit, 3.*

625. CONSERVATISM AND REFORM, 1920-1945.

American political, economic and intellectual life between the two World Wars. *Credit, 3.*

630. SOCIAL HISTORY OF THE UNITED STATES.

The evolving status of individuals and groups and problems of migration, livelihood, urbanization, and social conflict. *Credit, 3.*

636. HISTORY OF THE AMERICAN
LABOR MOVEMENT.*

Evolution of trade unionism as an American institution from the late 18th century to recent developments. Critical evaluation of changes in labor history. *Credit, 3.*

*Required course.

637. THE TWENTIETH CENTURY
AMERICAN CITY.

The industrial city and the full-scale urbanization of the United States in the twentieth century. The effect of city life upon the social, political and economic institutions of America, with emphasis on the historical origins of the complex problems of modern urban existence. *Credit, 3.*

DEPARTMENT OF INDUSTRIAL
ENGINEERING

752. MECHANIZATION AND
AUTOMATION.

Application of mechanization and automation techniques of industrial processes. Limitations and capabilities of numerically controlled machine tools and processes.

Credit, 3.

753. METHODS OF MEASURE-
MENT OF HUMAN WORK.

A critical study of the assumptions in measuring human effort in industry including the problems present in rating, predetermined data systems, the use of the high speed camera in securing data.

Prerequisites, IE 253 and 272 or equivalent.

Credit, 3.

Landscape Architecture

(See also Regional Planning)

GRADUATE FACULTY

Ervin H. Zube, *Head of the Department and Professor of Landscape Architecture*, B.S., Wisconsin, 1954; M.L.A., Harvard, 1959; F.A.A.R., American Academy in Rome, 1961.

Theodore S. Bacon Jr., *Professor of Planning*, B.A. Amherst 1942; M.C.P., Massachusetts Institute of Technology, 1956.

Carl A. Carlozzi, *Associate Professor of Resource Planning*, B.S., Kent State, 1955; M.A., 1957; Ph.D., Michigan, 1965.

Walter Cudnohufsky, *Assistant Professor of Landscape Architecture*, B.S., Michigan State, 1962; M.L.A., Harvard, 1965.

Hugh C. Davis, *Associate Professor of Resource Planning*, B.S., Rollins College, 1950; M.S., University of Michigan, 1955; Ph.D., 1960.

Nicholas T. Dines, *Assistant Professor of Landscape Architecture*, B.S., Michigan State, 1966; M.L.A., Harvard, 1968.

Julius Gy Fabos, *Associate Professor of Landscape Architecture*, B.S., Rutgers, 1961; M.L.A., Harvard, 1964.

Barrie Greenbie, *Associate Professor of Regional Planning*, B.S., Florida, 1953; M.S., Wisconsin, 1968.

Tom S. Hamilton, Jr., *Associate Professor of Landscape Architecture*, B.F.A., Illinois, 1950; M.S., Massachusetts, 1962.

Benjamin Isgur, *Adjunct Professor of Resource Planning*, B.S., Massachusetts, 1933; M.S., 1935; Ph.D., 1940.

Robert L. Kent, Jr., *Associate Professor of Landscape Architecture*, B.S., Michigan State, 1957; M.L.A., 1959.

Gordon S. King, *Professor of Arboriculture and Park Administration*, B.S., Michigan State, 1941; M.S., Massachusetts, 1956.

John H. Martin, *Assistant Professor of Architecture*, A.R.I.B.A., Brighton College of Art, 1956; Certificate, University College, London, 1960; M.L.A., Harvard, 1967.

Harold E. Mosher, *Associate Professor of Landscape Architecture*, B.S., 1942; B.L.A., 1947; M.L.A., Massachusetts, 1957.

Paul N. Procopio, *Professor of Landscape Architecture*, B.S., Massachusetts, 1941; M.S., 1954.

Andrew J. W. Scheffey, *Professor of Regional Planning*, B.A. Haverford 1951; M.S., Michigan, 1952; Ph.D., 1958.

MASTER OF LANDSCAPE
ARCHITECTURE

The degree is conferred upon graduate students who have satisfactorily met the following requirements.

- 1. Work covering at least two years in residence, and a minimum internship in a public or private office of at least three months. Specific requirements concerning the nature of such practice are determined by the department.
- 2. The earning of not fewer than 46 credits of which 28 shall consist of graduate level courses within the department, with specific exceptions at the discretion of the department.
- 3. Preparation of a satisfactory thesis or terminal project.
- 4. The passing of a final examination, written and/or oral.
- 5. Recommendation by the Department of Landscape Architecture to the Graduate School for the awarding of the degree and approval of the recommendation by the Dean of the Graduate School.
- 6. See additional requirements under the General Information section of this Catalog.

COURSES OPEN TO GRADUATE
STUDENTS ONLY

- 700. SPECIAL PROBLEMS. *Credit, 1-5.*
- 701, 702. DESIGN PROBLEMS.
Project design involving sites of increasing complexity and scale.
Credit, 5 each semester.
- 703. ECOLOGY AND
PHYSIOGRAPHY.
Visual evaluation of plant associations as related to land form and environmental conditions. Field studies. *Credit, 3.*
- 706. PRESENTATION.
Advanced visual communications techniques applicable to landscape architecture.
Credit, 3.
- 707. CONSTRUCTION.
Problems in landscape construction as related to general design. *Credit, 3.*

UNIVERSITY OF MASSACHUSETTS

- 708. CONSTRUCTION.
Road alignment, computations and advanced landscape construction. *Credit, 3.*
- 713, 714. SEMINAR.
Professional topics in landscape architecture.
Credit, 2 each semester.
- 791. ADVANCED DESIGN
PROJECTS.
Advanced design projects related to the regional environment. *Credit, 5.*
- 793, 794. SEMINAR.
Topics in environmental planning and design research and theory.
Credit, 2 each semester.
- 797. CONTRACTS, SPECIFICATIONS,
ESTIMATING COSTS.
Professional practice: commissions, contracts, specifications and estimating costs.
Credit, 3.
- 800. MASTER'S THESIS. *Credit, 8.*
- 801. TERMINAL PROJECT. *Credit, 8.*

COURSES OPEN TO BOTH
GRADUATE AND UNDER-
GRADUATE STUDENTS
(For either major or minor credit)

- 664. OPEN SPACE PLANNING
AND DESIGN.
The relationship of open space planning to city and regional planning; the various functions of open space; the problems of planning and designing parks and recreation areas to satisfy varying needs. *Credit, 3.*
- 671. LAND FORM.
The manipulation of land surfaces and its graphic representation through topographical plans, cross section profiles and models. Prerequisite, EnvDes (Environmental Design) 262. *Credit, 2.*
- 672. CONSTRUCTION MATERIALS.
Materials used in landscape construction, their design potential and limitations. Prerequisite, EnvDes 371. *Credit, 2.*
- ENVIRONMENTAL DESIGN
551, 552. HISTORY AND THEORY.
A broad survey of the history of the designed human environment. *Credit, 3 each semester.*

651, 652. THEORY.

Theories and techniques relevant to the analysis of design problems. Analysis of functional requirements and ecological factors influencing site development and the consideration of human needs and responses to the designed environment.

Credit, 3 each semester.

661. GRAPHIC COMMUNICATION II.

Current techniques used in the graphic communication of the analysis and solution of environmental design problems, and the development of facility in the use of various media.

Prerequisite, EnvDes 262.

Credit, 5.

662. APPLIED DESIGN.

The development of an approach embodying the application of theory and design principles to the solution of environmental design problems.

Prerequisites, EnvDes 351 and 361.

Credit, 5.

Linguistics

GRADUATE FACULTY

Donald C. Freeman, *Chairman of the Program, Associate Professor of Linguistics*, A.B., Middlebury College, 1959; M.A., Brown University, 1961; Ph.D., University of Connecticut, 1965.

Adrian Akmajian, *Assistant Professor of Linguistics*, B.A., University of Arizona, 1966; Ph.D., Massachusetts Institute of Technology, 1970.

James E. Cathey, *Assistant Professor of German*, B.S., Oregon State University, 1962; M.A., University of Washington, 1963; Ph.D., University of Washington, 1967.

Charles E. Clifton, Jr., *Associate Professor of Psychology*, A.B., Stanford University, 1960; Ph.D., University of Minnesota, 1964.

Robert P. Creed, *Professor of English*, B.A., Swarthmore College, 1948; M.A., Harvard University, 1949; Ph.D., Harvard University, 1956.

Frank W. Heny, *Assistant Professor of Linguistics*, B.A., University of Leeds, 1957; P.C.E., University College of Rhodesia, 1965; Ph.D., University of California, Los Angeles, 1970.

Carroll E. Reed, *Professor of German*, B.A., University of Washington, 1936; M.A., University of Washington, 1937; Ph.D., Brown University, 1941.

The Program in Linguistics offers graduate work leading to Master of Arts and Doctor of Philosophy degrees. Facilities and staff are available for students wishing to concentrate in linguistic theory, syntax, semantics, phonology, diachronic linguistics, Indo-European linguistics, particular language families, and stylistics. The Program in Linguistics also is responsible for the University's offerings in English as a Foreign Language. Graduate training prepares students for university teaching and research in theoretical and applied linguistics, private and governmental research positions, and the teaching of linguistics at the college level. Graduate courses in Linguistics are open to students in certain other language and literature programs for minor credit.

1. The M.A. in Linguistics

The purpose of the M.A. is to provide the student with a survey of modern linguistic theory and an introduction to the rationale and techniques of linguistic research.

A. Prerequisites for admission: A B.A. or B.S. degree with a major in anthropology, English, a foreign language, mathematics, philosophy, psychology, sociology, or speech is preferred, although other fields of study may be acceptable. A student may be required to make up deficiencies in undergraduate training before being admitted to regular status.

B. Program of study: Thirty credit hours of graduate work, toward which the following courses are required: Linguistics 501, 502, 503, and 504 or 708; German 706; Speech 584.

C. Examinations: a three-hour written

examination followed by a one-hour oral examination.

D. Thesis: None required.

2. *The Ph.D. in Linguistics*

Holders of the Ph.D. in Linguistics must demonstrate a sure command of modern linguistic theory and the capacity to conduct significant research.

A. Prerequisites for admission: An M.A. in Linguistics or a related field (students with master's degrees from other institutions or in areas other than linguistics may be asked to take additional courses to make up deficiencies in training).

B. Program of Study: Thirty credits beyond the M.A. of which at least one course must be taken in each of the following areas (one of these areas will be the candidate's field of specialization).

(1) Linguistic Theory (*e.g.*, Linguistics 701, 702, 703, or 707).

(2) Psycholinguistics or Sociolinguistics (*e.g.*, Psychology 725, 762, or 763; Linguistics 711).

(3) Philosophy of Language, Mathematical Linguistics, or Logic (Linguistics 709, Philosophy 581, 582, 702, 755).

(4) Indo-European Linguistics or the structure and history of a specific Indo-European or non-Indo-European language or language group (Linguistics 704, 705, or 706; English 702, 703, or 704; French 710; Germanic Languages 559, 710, or 711; Slavic Languages 563; Spanish 710).

C. Languages: A reading knowledge of two languages is required for the Ph.D. Candidates may be asked to demonstrate competence in additional languages, depending on their programs of study and research.

D. Examinations:

(1) Upon completion of the course work for the Ph.D., a comprehensive written and oral examination must be passed.

(2) Upon acceptance of the dissertation, a final oral examination in the field of the dissertation must be passed.

E. Dissertation: A scholarly dissertation will be required.

COURSES OPEN TO GRADUATE STUDENTS ONLY

700. SPECIAL PROBLEMS.

Selected research problems in Linguistics.
Credit, 1-12.

701. LINGUISTIC THEORY I:

PĀNINI TO DESCARTES.

The history and development of grammatical theory in Ancient India, Greece, Rome, and Western Europe through the 17th Century.
Credit, 3. Mr. Heny.

702. LINGUISTIC THEORY II:

THE EIGHTEENTH CENTURY TO THE RISE OF PRESCRIPTIVISM.

The history and development of grammatical theory in Europe and the United States from Leibniz to Bloomfield.
Credit, 3. Mr. Freeman.

703. LINGUISTIC THEORY III:

POST-BLOOMFELDIAN LINGUISTICS.

Linguistic theory in America and Europe since 1933. Tagmemics, glossematics, stratificational grammar, transformational-generative grammar, the "London School."
Credit, 3. Mr. Akmajian, Mr. Heny, Mr. Vetter.

704. INDO-EUROPEAN LINGUISTICS I: PHONOLOGY.

The phonological structure of the dialects of Indo-European and of the reconstructed model.
Credit, 3. Mr. Demers.

705. INDO-EUROPEAN LINGUISTICS II: MORPHOLOGY.

The morphological structure of the dialects of Indo-European and of the reconstructed model.
Credit, 3. Mr. Demers.

706. NON-INDO-EUROPEAN LINGUISTIC STRUCTURES.

The phonological and syntactic structures of some non-Indo European language or group of languages. Topics vary from year to year. May be repeated for credit.

Credit, 3. Staff.

707. COMPARATIVE LINGUISTICS.

The procedures and methods for comparing and contrasting languages. Lexical and morpho-syntactic comparisons. Lexicostatistics and glottochronology.

Credit, 3. Mr. Vetter.

708. DIALECTOLOGY.

The geographical and cultural variations within a language; mapping of dialects; analysis, and interpretation of dialect materials.

Credit, 3. Mr. Reed.

709. MATHEMATICAL LINGUISTICS.

Models of language; representation and theoretical description of formal properties of natural languages. Logical, statistical, and set-theoretical operations.

Prerequisites: Linguistics 703 and some knowledge of modern finite mathematics or computer science.

Credit, 3. Mr. Vetter.

710. SEMANTICS.

The problem of meaning in linguistics. The bases of semantic analysis and the concepts of semantic theory.

Credit, 3. Mr. Heny.

711. SOCIOLINGUISTICS.

The social differentiations of phonology and morpho-syntax. The relationship of speech to social status. The effects of urbanization on regional vocabulary.

Credit, 3. Mr. Salzmann.

713. LINGUISTICS AND LITERATURE.

The application of modern linguistics to literary analysis. Meter, style, and explication of text on the basis of linguistic criteria.

Credit, 3. Mr. Freeman.

714. CONTEMPORARY APPROACHES TO PHONETICS.

Examination of the theories of phonetics of the past two decades, with emphasis on the methods of analyzing such data as spectrograms.

Credit, 3. Mr. Demers.

790. SEMINAR.

Presentation of current research topics and literature.

Credit, 3. Staff.

COURSES OPEN TO BOTH GRADUATE AND UNDER-GRADUATE STUDENTS

(For either major or minor credit)

501. GENERAL LINGUISTICS

A comprehensive treatment of the field of linguistics. The nature of language. Some language universals. Phonology, syntax, and other aspects of modern language theory.

Credit, 3. Staff.

502. PHONOLOGICAL THEORY.

Introduction to the theoretical and psychological bases of contemporary phonological analysis; the concepts of distinctive feature analysis.

Credit, 3. Mr. Demers.

503. SYNTAX.

An examination of the methods of work and sentence formation; the notions of grammaticality and of well-formed utterances. Prerequisite, Linguistics 501.

*Credit, 3. Mr. Akmajian,
Mr. Heny, Mr. Vetter.*

504. FIELD METHODS.

The methodology of doing linguistic work in the field; preparing questionnaires; analysis of data; use of the tape recorder.

Credit, 3. Mr. Heny.

Marine Sciences

GRADUATE FACULTY

Charles S. Yentsch, *Director of the Marine Station and Professor of Marine Sciences*, B.S., University of Louisville, 1950; M.S., Florida State University, 1953.

Charles F. Cole, *Associate Professor of Fisheries Biology*, B.A., Cornell, 1950; Ph.D., 1957.

D. Craig Edwards, *Assistant Professor of Zoology*, B.A., Swarthmore, 1961; Ph.D., Chicago, 1965.

Miles O. Hayes, *Associate Professor of Geology*, A.B., Berea College, 1957; M.A., Washington University, 1959; Ph.D., Texas, 1965.

William E. Heronemus, *Professor of Civil Engineering*, B.S., United States Naval

Academy, 1941; M.S., Massachusetts Institute of Technology, 1948.

Robert E. Levin, *Assistant Professor of Food Science and Technology*, B.S., Los Angeles State College, 1952; M.S., Southern California, 1954; Ph.D., California, 1963.

Warren Litsky, *Director and Commonwealth Professor of Agricultural and Industrial Microbiology*, B.A., Clark University, 1945; M.S., Massachusetts, 1948; Ph.D., Michigan State, 1951.

Gregory W. Webb, *Associate Professor of Geology*, B.A., Columbia, 1948; M.A., 1950; Ph.D., 1954.

Robert T. Wilce, *Associate Professor of Botany*, B.S., University of Scranton, 1950; M.S., Vermont, 1952; Ph.D., Michigan, 1957.

The interdisciplinary program in Marine Sciences leads to the Master of Science degree, enabling the student to go directly into marine research or to continue work for the Ph.D. degree in one of the speciality fields. The program includes a core curriculum of biological, geological, and physical oceanography and a specialty option in Geology, Botany, Zoology, Microbiology, Fisheries, or Food Science and Technology. It is carried out on the Amherst campus, the Marine Station in Gloucester and at selected coastal sites, the research emphasis presently being primarily in estuarine and coastal waters.

Students entering the Marine Science Program should have completed an undergraduate degree in science or engineering, normally including at least one year each of Mathematics, Physics, Chemistry, and Biology. Any deficiencies should be remedied in the first year of residence in the Program, although such work would not receive graduate credit. Exceptions may be made in individual cases. Acceptance to the program involves admission to the Graduate School of the University and admission by the Interdisciplinary Committee in the Marine Sciences. Appropriate faculty members will serve as the students' advisers

and supervise the studies and research in the various specialty options.

CORE COURSES

GEOLOGY 655.

PHYSICAL OCEANOGRAPHY.

Physical properties of sea water and their variations; water masses and circulation; interactions between ocean and atmosphere; wave, tide and current dynamics; techniques of oceanographic study.

Prerequisites, one year of college physics; calculus recommended.

Credit, 3. Mr. Hayes.

GEOLOGY 752.

GEOLOGICAL OCEANOGRAPHY.

Physical characteristics and geological processes of the ocean basins and margins, and their bearing on interpretation of geologic history.

Credit, 3. Mr. Webb.

MARINE SCIENCE 501.

BIOLOGICAL OCEANOGRAPHY.

Aspects of major planktonic and benthic marine taxa, including distribution, periodicity, and dominant ecological factors. Emphasis on shallow water organisms and habitats.

Credit, 3. Interdepartmental Staff.

OPTIONAL SPECIALTY COURSES

MARINE SCIENCE 550.

MICROBIAL ECOLOGY OF MARINE ENVIRONMENT.

The ecology, function and importance of microorganisms in the marine environment including the underlying sediments; their role in the food chain and productivity of the seas and estuaries; and the factors influencing seasonal and geographical population dynamics.

Prerequisites, general courses in biology, microbiology, and chemistry and permission of instructor.

Credit, 2. Mr. Litsky.

MARINE SCIENCE 700.

SPECIAL PROBLEMS IN OCEANOGRAPHIC TECHNIQUES.

Credit, 1-6. Staff.

Other optional courses are listed under the headings of the several cooperating departments.

COURSE FOR STUDENTS IN
OTHER PROGRAMS

MARINE SCIENCE 525.
INTRODUCTORY
OCEANOGRAPHY.

A survey of the oceans and sea water, the substrate, marine life, and processes; oceanographic techniques. For students in engineering and others desiring a general knowledge of the sea.

Prerequisites: one year of college level physics, chemistry, and mathematics.

Credit, 3. Interdepartmental Staff.

Mathematics and Statistics

(See also Statistics)

GRADUATE FACULTY- MATHEMATICS

Wayman L. Strother, *Head of the Department and Professor of Mathematics*, B.S., Alabama State, 1943; M.S., University of Chicago, 1949; Ph.D., Tulane, 1951.

James C. Becker, *Assistant Professor of Mathematics*, B.S., Catholic University of America, 1957; M.S., Carnegie Institute of Technology, 1959; Ph.D., University of Michigan, 1964.

Joseph T. Borrego, Jr., *Assistant Professor of Mathematics*, B.A., University of Florida, 1961; M.S., 1962; Ph.D., 1966.

Joseph T. Buckley, *Assistant Professor of Mathematics*, B.S., Boston College, 1958; Ph.D., Indiana University, 1964.

Donald E. Catlin, *Assistant Professor of Mathematics*, B.S., Pennsylvania State University, 1958; M.A., 1961; Ph.D., University of Florida, 1965.

Yu W. Chen, *Professor of Mathematics*, Ph.D., University of Goettingen, Germany, 1934.

Haskell Cohen, *Professor of Mathematics*, A.B., University of Omaha, 1942; S.M., University of Chicago, 1947; Ph.D., Tulane, 1952.

Edward A. Conners, *Assistant Professor of Mathematics*, B.A., College of the Holy Cross, 1962; M.A., University of Massachusetts, 1964; Ph.D., University of Notre Dame, 1968.

Thurlow A. Cook, *Assistant Professor of Mathematics*, A.B., University of Rochester, 1961; M.A., University of Buffalo, 1963; Ph.D., Florida State University, 1967.

Helen F. Cullen, *Associate Professor of Mathematics*, A.B., Radcliffe, 1940; M.A. Michigan, 1944; Ph.D., 1950.

David J. Dickinson, *Associate Professor of Mathematics*, B.S., University of Denver, 1942; M.A., Columbia, 1948; Ph.D., Michigan, 1954.

Murray Eisenberg, *Associate Professor of Mathematics*, A.B., University of Pennsylvania, 1960; A.M., 1962; Ph.D., 1965.

Hans R. Fischer, *Professor of Mathematics*, University of Zurich, Matriculation, 1952; Ph.D., 1959.

David J. Foulis, *Professor of Mathematics*, B.A., University of Miami, 1952; M.S., 1953; Ph.D., Tulane, 1958.

David R. Hayes *Associate professor of Mathematics*, A.B., Duke, 1959; Ph.D., 1963.

James H. Hedlund, *Assistant Professor of Mathematics*, B.A., Cornell University, 1963; M.A., University of Michigan, 1965; Ph.D., 1968.

Douglas N. Hertz, *Assistant Professor of Mathematics*, B.S., Massachusetts Institute of Technology, 1963; M.A., Brandeis University, 1965; Ph.D., 1967.

Samuel S. Holland, Jr., *Associate Professor of Mathematics*, B.S., Massachusetts Institute of Technology, 1950; M.S., Chicago, 1952; Ph.D., Harvard, 1961.

Norman E. Hurt, *Assistant Professor of Mathematics*, Ph.D., University of Chicago, 1967.

Henry G. Jacob, *Professor of Mathematics*, B.E., Yale, 1943; M.E., 1947; Ph.D., 1953.

Melvin Janowitz, *Professor of Mathematics*, B.A., University of Minnesota, 1950; Ph.D., Wayne State University, 1963.

Harry F. Joiner, II, *Assistant Professor of Mathematics*, B.A., Texas Christian University, 1965; M.S., Florida State University, 1966; Ph.D., 1968.

Stephen L. Jones, *Assistant Professor of Mathematics*, B.A., University of Texas, 1964; Ph.D., University of Wisconsin, 1967.

Eleanor Killam, *Assistant Professor of Mathematics*, B.S., New Hampshire, 1955; M.S., 1956; Ph.D., Yale, 1961.

Hsu-Tung Ku, *Assistant Professor of Mathematics*, B.S., Taiwan Normal University, 1961; M.S., Tulane, 1964; Ph.D., 1967.

Esayas G. Kundert, *Professor of Mathematics*, Diploma, E.T.H., Zurich, 1945; Ph.D., 1950.

Lorraine D. Lavalley, *Associate Professor of Mathematics*, A.B., Mount Holyoke, 1953; M.A., Massachusetts, 1955; Ph.D., Michigan, 1962.

Teng-Sun Liu, *Associate Professor of Mathematics*, B.S., National Taiwan University, 1954; M.A., Pennsylvania, 1961; Ph.D., 1963.

Larry N. Mann, *Professor of Mathematics*, B.A., Pennsylvania, 1955; M.A., 1956; Ph.D., 1959.

Wallace S. Martindale, *Professor of Mathematics*, B.A., Amherst, 1952; M.A., Pennsylvania, 1954; Ph.D., 1958.

Charles H. Randall, *Associate Professor of Mathematics*, B.S.M.E., Polytechnic Institute of Brooklyn, 1951; M.S., University of Pittsburgh, 1957; Ph.D., Rensselaer Polytechnic Institute, 1966.

Ellen E. Reed, *Assistant Professor of Mathematics*, B.A., Gonzaga University, 1962; M.A., University of Colorado, 1964; Ph.D., 1966.

Donald F. St. Mary, *Assistant Professor of Mathematics*, B.S., McNeese State College, 1962; M.A., University of Kansas, 1964; Ph.D., University of Nebraska, 1968.

Jon L. Sicks, *Assistant Professor of Mathematics*, B.A., Indiana University, 1961; Ph.D., 1965.

Doris S. Stockton, *Assistant Professor of Mathematics*, B.S., Douglass College in Rutgers University, 1945; M.S., Brown, 1947; Ph.D., 1958.

Marshall H. Stone, *Birkhoff Professor of Mathematics*, B.A., Harvard, 1922; M.A., 1924; Ph.D., 1926.

Albert J. Storey, *Assistant Professor of Mathematics*, B.A., Washington and Lee University, 1961; M.A., University of Miami, 1964; Ph.D., 1968.

Jin Chen Su, *Associate Professor of Mathematics*, B.S., National Taiwan University, 1954; Ph.D., Pennsylvania, 1962.

Robert W. Wagner, *Associate Dean of the College of Arts and Sciences and Professor of Mathematics*, A.B., Ohio, 1934; M.A., Michigan, 1935; Ph.D., 1937.

Ju-Kwei Wang, *Professor of Mathematics*, B.S., National Taiwan University, 1954; Ph.D., Stanford University, 1960.

George W. Whaples, *Professor of Mathematics*, A.B., Knox College, 1935; A.M., Wisconsin, 1937; Ph.D., 1939.

UNIVERSITY OF MASSACHUSETTS/BOSTON GRADUATE FACULTY

Alfonso G. Aspetitia, *Professor of Mathematics*, B.A., University of Madrid, 1939; M.S., 1949; Ph.D., 1952.

James S. Byrnes, *Assistant Professor of Mathematics*, B.A., New York University, 1963; M.A., Yeshiva University, 1965; Ph.D., 1967.

Ernest Dubois, *Assistant Professor of Mathematics*, M.A., E.T.H. (Swiss Federal Institute for Technology), 1959; Ph.D., 1967.

Aiden P. Gallagher, *Assistant Professor of Mathematics*, B.Sc., University College, Cork, Ireland, 1954; M.Sc., 1955; Ph.D., Queens College, Belfast, 1962.

Herbert Kamowitz, *Associate Professor of Mathematics*, B.S., City College of New York, 1952; Sc.M., Brown, 1954; Ph.D., 1960.

John A. Lutts, *Assistant Professor of Mathematics*, B.A., Spring Hill College, 1957; M.A., University of Pennsylvania, 1959; Ph.D., 1961.

Juan C. Marlo, *Associate Professor of Mathematics*, M.A., University of Buenos Aires, 1957; Ph.D., 1961.

Stephen K. Parrott, *Assistant Professor of Mathematics*, B.A., University of Michigan, 1961; M.A., 1963; Ph.D., 1965.

Lazaro Recht, *Assistant Professor of Mathematics*, M.A., University of Buenos Aires, 1963; Ph.D., 1969.

Geza Schay, Jr., *Associate Professor of Mathematics*, B.A., Eotvos University, Hungary, 1956; Ph.D., Princeton, 1961.

Helen Skala, *Assistant Professor of Mathematics*, B.S., Mundelein College, 1965; M.S., Illinois Institute of Technology, 1966; Ph.D., 1969.

Taffee Tamimoto, *Professor of Mathematics*, A.B., University of California (Los Angeles), 1942; M.S., University of Chicago, 1946; Ph.D., University of Pittsburgh, 1950.

Richard Turyn, *Associate Professor of Mathematics*, B.A. Harvard, 1951; M.A., 1952; Ph.D., 1964.

So-fei Wei, *Assistant Professor of Mathematics*, B.S., National Taiwan University, 1962; Ph.D., University of Pennsylvania, 1967.

SPECIAL DEPARTMENT ENTRANCE REQUIREMENTS

Mathematics Program

Each entering graduate student in Mathematics must have completed at least 18 semester credit hours in undergraduate mathematics beyond the content of Differential and Integral Calculus. A one-year course in Modern Algebra and a one-year course in Advanced Calculus would be desirable. Any entering graduate student not familiar with the content of Math 500 is required to take this course in his first semester.

SPECIAL DEGREE REQUIREMENTS

Master's Degree Program

The following courses are required for a Master's degree: 711, 721, 723, 771, and either 889, 890 or 891, 892.

Of the total of 30 graduate credit-hours required, not more than six credit-hours may be taken in other departments, and at least 18 must be in mathematics courses numbered 700 or above. The choice of courses taken in other departments is subject to the approval of this department.

The Department may require the successful completion of a general written qualifying examination before the student takes the general oral examination required by the University for the Master's degree.

Ph.D. Program

The Ph.D. Program conforms to the general provisions of the Graduate School. The Department requires that all doctoral candidates present reading knowledge in two of the languages French, German, Russian, sufficient to understand journal material. A student need not obtain a Master's degree on the way to the doctorate, but all students may be required to pass a qualifying examination prior to taking the preliminary comprehensive examination for the Ph.D. The preparation for the preliminary comprehensive examination normally requires one full year of study beyond the minimum for a Master's degree.

The preliminary comprehensive examination will be oral and/or written. The candidate is questioned in depth on the basics of algebra, analysis and topology, and on advanced topics in at least two of these fields. Consequently, course preparation for the examination might normally consist of the following:

- (a) 711-712. Introduction to modern algebra;
- (b) 723-724. Theory of functions of a real variable;

(c) 721–722. Theory of functions of a complex variable;

(d) 771 and either 772 or 773. Introduction to topology.

(e) Additional courses at the 800 level chosen from more than one area and approved by the Department.

Any 700 or 800 level course can be taken, without the stated prerequisites, by special permission of both the student's adviser and the course instructor. Further information on the graduate degree programs in mathematics is contained in a brochure available from the Department of Mathematics.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. TOPICS COURSE.

Topics may be chosen from the fields of algebra, geometry, theory of functions, topology, and applied mathematics.

Prerequisite, permission of instructor.

Credit, 1 to 3.

701, 702. TOPICS IN ALGEBRA.

Basic topics in algebra.

Prerequisite, permission of instructor.

Credit, 1 to 3 each semester.

703, 704. TOPICS IN GEOMETRY.

Basic topics in geometry.

Prerequisite, permission of instructor.

Credit, 1 to 3 each semester.

705, 706. TOPICS IN ANALYSIS.

Basic topics in analysis.

Prerequisite, permission of instructor.

Credit, 1 to 3 each semester.

711, 712. INTRODUCTION TO MODERN ALGEBRA.

Groups, rings, algebras, fields, modules, linear transformations and matrices, tensor products, homological algebra.

Prerequisite, Math 512.

Credit, 3 each semester.

713. INTRODUCTION TO ALGEBRAIC NUMBER THEORY.

The basic theory of valuations, rings of integral elements, and ideal theory in algebraic number fields and fields of algebraic

functions of one variable, including Dirichlet-Hasse unit theorem and Riemann-Roch theorem for curves.

Prerequisite, Math 711–712 or equivalent.

Credit, 3.

714. QUADRATIC FORMS.

Quadratic spaces, the orthogonal group, the representation and equivalence of quadratic forms over arithmetic fields, the Hasse-Minkowski theorem, the integral theory of quadratic forms over arithmetic domains, the genus and the spinor genus.

Prerequisite, Math 711–712 and 713 or their equivalents.

Credit, 3.

715, 716. CLASS FIELD THEORY.

Local class field theory, residues in fields of algebraic functions, global class field theory, generalized local class field theory, application to simple algebras and quadratic forms.

Prerequisite, Math 713.

Credit, 3 each semester.

721, 722. THEORY OF FUNCTIONS OF A COMPLEX VARIABLE.

Linear transformations of a complex variable, power series and elementary functions, holomorphic functions and Cauchy's Theorem, theory of residues, isolated singularities, conformal sentations by means of products and partial fractions, elliptic functions, analytic continuation and Riemann surfaces, algebraic functions.

Prerequisite, Math 626.

Credit, 3 each semester.

723, 724. THEORY OF FUNCTIONS OF A REAL VARIABLE.

The real number system, Lebesgue measure and the Lebesgue mappings, entire and meromorphic functions and their representing integral, differentiation and integration, the classical Banach spaces, abstract spaces, general measure and integration theory.

Prerequisite, Math 625.

Credit, 3 each semester.

725. INTRODUCTION TO FUNCTIONAL ANALYSIS.

Banach and Hilbert spaces, continuous linear operators, spectral theory, Banach algebras.

Prerequisites, Math 512 and 771 (co-requirement).

Credit, 3.

726. INTRODUCTION TO
FUNCTIONAL ANALYSIS.

Continuation of Math 725. Topics from Banach algebra and representation theorems for Banach algebras; von Neumann algebras; analysis in Banach algebras, spectral theory; analytical theory of semigroups; vector lattices, Krein-Milman theorem.

Credit, 3.

731, 732. INTRODUCTION TO
PARTIAL DIFFERENTIAL
EQUATIONS.

Equations in mathematical physics, types of systems, characteristic manifolds, questions of uniqueness and existence, generalized derivatives.

Prerequisite, Math 626.

Credit, 3 each semester.

735. LATTICE THEORY I.

Partially ordered sets, lattices, modular lattices, Boolean algebras, representation theory for lattices.

Prerequisite, Math 512.

Credit, 3.

736. LATTICE THEORY II.

Continuation of Math 735. Stone's representation theorem for Boolean algebras, Loomis' representation theorem for Boolean sigma-algebras, introduction to the theory of orthomodular lattices and their coordinatizing Baer*-semigroups.

Prerequisite, Math 735.

Credit, 3.

745, 746. ADVANCED APPLIED
MATHEMATICS.

Topics from engineering and mathematical physics presented rigorously and with free use of abstract mathematical concepts and modern mathematical machinery.

Prerequisite, permission of instructor.

Credit, 3 each semester.

771, 772. INTRODUCTION TO
GENERAL TOPOLOGY.

Topological spaces, separation axioms, compactness, connectedness, metric spaces, product and quotient spaces, nets and filters, local properties, imbedding theorems, inverse limits, arcwise connectedness, arc theorems, indecomposable continua, introduction to homotopy theory and the funda-

mental group.

Prerequisite, Math 625.

Credit, 3 each semester.

773. ALGEBRAIC METHODS IN
TOPOLOGY.

May be substituted for Math 772. Manifolds, fundamental group, covering spaces, applications to group and knot theory, higher homotopy groups and exact sequences.

Prerequisite, Math 771.

Credit, 3.

781. ALGEBRAIC TOPOLOGY I.

Homotopy theory, simplicial and Cech homology theories.

Prerequisites, Math 771, 711.

Credit, 3.

802. ALGEBRAIC TOPOLOGY II.

General homology theory, universal coefficient theorems, singular homology theories, ring structure in cohomology theories, spectral sequences, Steenrod operations.

Prerequisite, Math 781.

Credit, 3.

803. ALGEBRAIC TOPOLOGY III.

Presheaves and sheaves, sheaf cohomology, Cech cohomology, applications: de Rham theorem; spectral sequences.

Prerequisite, Math 782.

Credit, 3.

811, 812. ADVANCED ALGEBRA.

Advanced topics in algebra.

Prerequisite, permission of instructor.

Credit, 3 each semester.

821, 822. ADVANCED COMPLEX
ANALYSIS.

Advanced topics in complex analysis.

Prerequisite, permission of instructor.

Credit, 3 to 6.

823, 824. ADVANCED ANALYSIS.

Advanced topics in analysis.

Prerequisite, permission of instructor.

Credit, 3 each semester.

831 832. ADVANCED ORDINARY
OR PARTIAL DIFFERENTIAL
EQUATIONS.

Advanced topics chosen from dynamic systems, differential operators with constant coefficients, hyperbolic and elliptic operators, non-linear equations, asymptotic expansions.

Prerequisite, permission of instructor.

Credit, 3 each semester.

835. ADVANCED LATTICE THEORY I.
Advanced topics chosen from the fields of orthomodular lattices, quasi-orthomodular lattices, continuous geometries, complemented modular lattices and their representation theories.

Prerequisite, Math 736. *Credit, 3.*

836. ADVANCED LATTICE THEORY II.
Continuation of Math 835 in which one or more of the topics of Math 835 is examined in detail up to the present frontiers of knowledge.

Prerequisite, Math 835. *Credit, 3.*

851, 852. DIFFERENTIAL TOPOLOGY.

Differential manifolds, immersions and imbeddings, Whitney approximation theorems, vector bundles, tangent and normal bundles, characteristic classes, and cobordism.

Prerequisites, Math 772 and 781.
Credit, 3 each semester.

853, 854. TOPOLOGICAL SEMIGROUPS.

Topics from ideals in semigroups, Green's relations, Rees-Suschkewitsch theorem, semigroup structures on continua, homomorphisms, irreducible semigroups, actions by semigroups, and other topics of current interest.

Prerequisite, Math 771-772 or equivalent.
Credit, 3 each semester.

861, 862. ADVANCED GEOMETRY.

Advanced topics in geometry.
Credit, 3 each semester.

871, 872. ADVANCED TOPOLOGY.

Advanced topics in topology.
Credit, 3 each semester.

881, 882. ADVANCED PURE AND/OR APPLIED MATHEMATICS.

Credit, 3 each semester.

883, 884. DIRECTED READINGS.

Credit, up to 6.

889, 890. PROBLEM SEMINAR.

Designed to introduce beginning graduate students to the methods of mathematical research.

Credit, 1 each semester.

891, 892. PROSEMINAR.

Presentation by the beginning graduate student of material from the mathematics literature.
Credit, 1 each semester.

893, 894. LITERATURE SEMINAR.

Presentation by the intermediate graduate student of material from the mathematics literature.
Credit, 1 each semester.

895, 896, 897, 898. RESEARCH SEMINAR.

Presentation by the advanced graduate student of research articles, perhaps his own research.
Credit, 1 each semester.

900. DOCTORAL DISSERTATION.

Credit, up to 30

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

533. PROBABILITY.

A postulational study of probability, including counting methods, random variables; additional topics chosen from Bayes theorem, statistical independence, laws of large numbers and Markov processes.

Corequisite, Math 174 or 186. *Credit, 3.*

545, 546. APPLIED MATHEMATICS I AND II.

Topics from engineering and mathematical physics are presented rigorously and with free use of abstract mathematical concepts and modern mathematical machinery.

Prerequisites, Math 200 and Math 174 or 186.
Credit, 3 each semester.

551. NUMERICAL ANALYSIS I.

Approximation and error evaluation; finite differences; approximation by polynomials using finite difference methods and minimal criteria; special reference to sets of orthogonal polynomials.

Prerequisites, Math 186 or 174; Comp Sci 121 (may be taken concurrently).

Credit, 3.

552. NUMERICAL ANALYSIS II.

Evaluation of definite integrals; solution of differential equations, polynomial equations, other conditional equations, and systems of linear equations with related matrix manipulations.

Prerequisite, Math 551. *Credit, 3.*

611. LINEAR ALGEBRA.

Row equivalence, linear transformations and matrices. Similarity, invariant subspaces, canonical forms. Inner product spaces, linear functions, the spectral theorem, bilinear forms.

Prerequisite, Math 512.

Credit, 3.

612. THEORY OF GROUPS.

Topics in group theory to be chosen from: Sylow theorems, Abelian groups, transformation groups, finite groups, representations of groups, characters and orthogonality relations.

Prerequisite, Math 512.

Credit, 3.

613. THEORY OF NUMBERS.

Euclid's algorithm, theory of prime numbers, aliquot parts, congruences, further topics in number theory.

Prerequisite, Math 500.

Credit, 3.

625. INTRODUCTORY MODERN ANALYSIS I.

Basic topology of the real number system. Limit concept and continuity. Differentiation. Partial differentiation. Riemann-Stieltjes integration.

Prerequisites, Math 500 and Math 174 or 186.

Credit, 3.

626. INTRODUCTORY MODERN ANALYSIS II.

Multivariable analysis and the Green, Gauss and Stokes theorems.

Prerequisite, Math 625.

Credit, 3.

641. FOURIER SERIES AND ORTHOGONAL FUNCTIONS.

Solutions of boundary value problems by Fourier series, Bessel functions, Legendre polynomials; convergence of representations by orthogonal functions.

Prerequisite, Math 643 or 187.

Credit, 3.

662. HIGHER GEOMETRY.

Topics chosen from projective geometry, affine geometry, convex sets, continuous geometry.

Prerequisites, Math 500 and 512.

Credit, 3.

663. DIFFERENTIAL GEOMETRY.

Differential geometry of curves and surfaces in Euclidean 3-space using vector methods. Prerequisite, Math 521 or permission of instructor.

Credit, 3.

671. SET THEORY.

Basic properties of sets. Ordered sets. Complete ordered sets. Well-ordered sets. Cardinal and ordinal numbers. Axiom of choice, well-ordering theorem, Zorn's Lemma and other forms of the axiom of choice. Cardinal arithmetic.

Corequisite, Math 625 or permission of instructor.

Credit, 3.

COURSES NOT FOR MAJOR CREDIT

(No graduate credit for students majoring in Mathematics)

500. FUNDAMENTAL CONCEPTS OF MATHEMATICS.

Non-axiomatic propositional calculus (with truth tables), basic quantification theory and set algebra. Binary relations, equivalence relations, partitions, functions. Development of the basic algebraic and topological features of the real numbers from the axioms for a complete ordered field. Complex numbers regarded as ordered pairs of real numbers.

Prerequisite, permission of instructor or adviser.

Credit, 3.

511. INTRODUCTION TO MODERN ALGEBRA I.

Introduction to semigroups, groups, rings, fields, and modules.

Prerequisite, Math 200.

Credit, 3.

512. INTRODUCTION TO MODERN ALGEBRA II.

Polynomials, cyclic groups, finite dimensional vector spaces, linear transformations, elementary theory of matrices and determinants.

Prerequisite, Math 511.

Credit, 3.

521 VECTOR ANALYSIS.

The algebra calculus of vectors with applications to physics and other fields.

Prerequisite, Math 174 or 186.

Credit, 3.

557. LINEAR PROGRAMMING AND THEORY OF GAMES.

The Simplex Method and extensions; duality theorems; transportation problems and other applications; finite two-person zero-sum games and the fundamental theorem.

Prerequisite, permission of instructor.

Credit, 3.

585. SURVEY OF ADVANCED
MATHEMATICS FOR ENGI-
NEERS.

Series solution of differential equations, boundary value problems, functions of several variables, partial differential equations, numerical analysis and the Laplace transform. Not available for majors in mathematics.

Prerequisite, Math 187. *Credit, 3.*

586. SURVEY OF ADVANCED
MATHEMATICS FOR
ENGINEERS.

Vectors and vector spaces, vector field theory, complex analysis. Not available for majors in mathematics.

Prerequisite, Math 585. *Credit, 3.*

643. ORDINARY DIFFERENTIAL
EQUATIONS.

First and second order differential equations, linear equations, power series solutions, existence and uniqueness, plane autonomous systems, stability, Strum-Liouville systems, eigenvalues and eigenfunctions.

Prerequisite, Math 174 or 186. *Credit, 3.*

681. APPLIED COMPLEX
VARIABLES.

The algebra of complex numbers, the elementary functions and their mappings, differentiation, integration, Taylor series, and residues. Applications to physics and engineering.

Prerequisite, Math 186. *Credit, 3.*

Statistics

GRADUATE FACULTY- STATISTICS

Irwin Guttman, *Professor of Statistics*, B.S., McGill University, 1951; M.A., University, 1951; M.A., University of Toronto, 1953; Ph.D., 1955.

Joseph Horowitz, *Assistant Professor of Statistics*, B.S., Massachusetts Institute of Technology, 1962; M.S., University of Michigan, 1963; Ph.D., 1967.

Robert Kleyle, *Assistant Professor of Statistics*, B.A., Duquesne, 1960; M.S., Pittsburgh, 1962; Ph.D., Harvard, 1968.

Gail B. Oakland, *Professor of Statistics*, B.A., University of Saskatchewan, 1933;

M.A., Minnesota, 1939; Ph.D., University of Aberdeen, 1956.

Berthold Schweizer, *Professor of Statistics*, B.S., Massachusetts Institute of Technology, 1951; M.S., Illinois Institute of Technology, 1954; Ph.D., 1956.

Morris Skibinsky, *Professor of Statistics*, B.S., City College of New York, 1948; M.A., University of North Carolina, 1951; Ph.D., 1954.

Robert W. Wagner, *Associate Dean of the College of Arts and Sciences and Professor of Mathematics*, B.A., Ohio University, 1934; M.A., Michigan, 1935; Ph.D., 1937.

STATISTICS PROGRAM

Special Departmental Entrance Requirements for Statistics

Each entering graduate student in Statistics must have completed at least 18 semester credit hours in undergraduate statistics, or in mathematics beyond the content of Differential and Integral Calculus. A one-year course in Matrix Algebra and a one-year course in Advanced Calculus would be highly desirable.

Master's Degree Program in Statistics

The candidate will consult with a member of the faculty in preparing a program of study. A total of 30 credit hours is required. All masters candidates must take the following courses: 705, 706, 707, 805, 806 amounting to a total of 15 credit hours. Six credit hours may be used for remedial mathematics courses, e.g., mathematics 611 and 625. Remedial courses beyond six hours or lower level mathematics courses, e.g. mathematics 173, 174, may be required (depending upon the student and at the discretion of the student's adviser) for no credit given. A minimum of six credit hours in mathematics is encouraged but not required. A maximum of six credit hours may be taken, subject to approval, in departments other than Mathematics and Statistics. At least three credit hours must be taken from Statistics course offerings other than those required.

The candidate is expected to obtain experience in statistical applications. A minor role in consulting work or an internship in an organization where statistics can be applied provides experience in this direction.

The Department may require the successful completion of a general written qualifying examination before the student takes the general oral examination required by the University for the Master's degree.

COURSES OPEN TO GRADUATE STUDENTS ONLY

701, 702. STATISTICAL TEST AND DECISION PROCEDURES.

Power of a test, O.C. curves, parametric tests, F. Hotelling's T, multiple comparisons, Bartlett's test. Non-parametric tests; Chi-square, Kolmogorov-Smirnov, order statistics, ranking.
Prerequisites, Stat 615; Math 611 and 625, or equivalent. *Credit, 3 each semester.*

705, 706. PROBABILITY THEORY FOR STATISTICS.

Experiments, sample spaces, probability measures, combinatorics, random variables, distribution functions, conditional probability, independence, derived distributions, moment generating functions, central limit theorem. Borel sets, measures, correspondence theorem, random variables, expectations, product spaces, multivariate distributions, convolutions, weak and strong laws of large numbers, uniqueness theorem, central limit theorem, Radon-Nikodym theorem and the general concept of conditioning.
Prerequisites, Math 173, 174 or equivalent, Prerequisite or corequisite, Math 625 or equivalent. *Credit, 3 each semester.*

707. A FIRST COURSE IN MATHEMATICAL STATISTICS.

Distribution theory, maximum likelihood estimation, confidence intervals, sufficiency, point estimation, hypotheses testing, Bayesian inference, decision theory, nonparametric statistics, survey of special topics.
Prerequisite, Stat 605. *Credit, 3.*

725, 726. ESTIMATION THEORY AND HYPOTHESIS TESTING.

Maximum likelihood, types of estimation, properties of estimators, 2 sample problem, k sample problem.

Prerequisites or corequisites, Stat 562 and 582; Math 611 and 625, or equivalent.

Credit, 3 each semester.

805, 806. ADVANCED MATHEMATICAL STATISTICS.

Review and extension of 705, 706, 707. Characteristic functions and their properties, central limit theorems, matrix algebra and multivariate analysis, bounds for the variance. Sufficiency, completeness, efficiency, maximum likelihood, least squares, tests, interval estimation, multiple comparisons.
Prerequisites, Stat 706, and 707.

Credit, 3 each semester.

841, 842. RECENT DEVELOPMENT IN STATISTICS.

Such modern areas of statistical thought as: stochastic processes, counting, gaussian and stationary processes, spectral distribution functions, birth and death processes, monte carlo, box's optimizing processes.
Prerequisites, Math 611 and 625, or equivalent. *Credit, 3 each semester.*

851, 852. ADVANCED PROBABILITY, I AND II.

Measure and integration, distribution and characteristic functions, Laplace transforms; laws of large numbers, central limit theorem; laws of large numbers, central limit theorem; Radon-Nikodym theorem, conditioning. Topics from among the following: the general central limit problem, classes of probability laws, domains of attraction; foundations of random processes, Kolmogorov consistency theorem, potential theory; ergodic and information theory.

Prerequisites, Math 723 or Stat 706 or permission of instructor.

Credit, 3 each semester.

880. SEMINAR.

Research papers by staff and students; invited lectures by prominent statisticians.

Credit, 1-3.

COURSES OPEN TO BOTH
GRADUATE AND UNDER-
GRADUATE STUDENTS
(For either major or minor credit)

531. INTRODUCTION TO FUNDAMENTALS OF STATISTICAL INFERENCE I.

Random experiments and probability models; independence; conditional probability; sampling; random variables; data representations; special distributions; deduction and inference.

Prerequisite, Math 011 or equivalent.

Credit, 3.

532. INTRODUCTION TO FUNDAMENTALS OF STATISTICAL INFERENCE II.

Point, interval and model estimation; hypothesis testing; optimality concepts; power; least squares techniques; decision theoretic notions.

Prerequisite, Stat 531.

Credit, 3.

561. ADVANCED STATISTICAL ANALYSIS OF EXPERIMENTAL DATA (I).

Purpose of experimental designs and their basic assumptions; individual comparisons, components of error, confounding; applications from various fields.

Prerequisite, Stat 551.

Credit, 3.

562. ADVANCED STATISTICAL ANALYSIS OF EXPERIMENTAL DATA (II).

Analysis of data with disproportionate subclass numbers. Includes the method of fitting constants, the method of weighted squares of means, absorption of equations, expectations of mean squares, and tests of hypotheses.

Prerequisite, Stat 561.

Credit, 3.

571. SURVEY SAMPLING.

The theory and practice of sampling, optimum allocation of resources, estimation of sample size, various sampling methods, ratio and regression estimates, the problem of non-response.

Prerequisite, Stat 551 or 615.

Credit, 3.

572. SAMPLING THEORY AND METHODS.

Problems and methods of sampling, production and quality control, acceptance sampling, O.C. and A.S.N. curves, types and properties of estimators.

Prerequisite, Stat 551 or 615.

Credit, 3.

581. MULTIVARIATE ANALYSIS (METHODS).

Application of the theory in Statistics 582 to actual problems; it may involve research studies by the students, critiques of published research, or analysis of other bodies of data.

Prerequisite, Stat 551 or 615.

Credit, 3.

582. MULTIVARIATE ANALYSIS (THEORY).

Correlations and regression, principal components, canonical analysis, analysis of dispersion and covariance, tests of homogeneity, discriminant functions.

Prerequisite, Stat 615.

Credit, 3.

615. INTRODUCTION TO THE THEORY OF STATISTICS (I).

Distributions of random variables, conditional probability and stochastic independence, moment generating functions, sampling distributions of common statistical estimators, transformation of random variables.

Prerequisite, Stat 615.

Credit, 3.

616. INTRODUCTION TO THE THEORY OF STATISTICS (II).

Interval estimation, point estimation, sufficient statistics, tests of hypothesis, the analysis of variance, the multivariate normal distribution, distributions of quadratic forms and linear statistical models.

Prerequisite, Stat 615.

Credit, 3.

COURSES NOT FOR MAJOR CREDIT

(No graduate credit for students majoring in statistics)

551. ELEMENTARY STATISTICS.

Analysis of variance, the design of experiments, simple surveys, multiple regression, non-parametric tests.

Prerequisite, Stat 121.

Credit, 3.

Mechanical and Aero-Space Engineering

GRADUATE FACULTY

John R. Dixon, *Head of the Department of Mechanical and Aero-Space Engineering and Professor of Mechanical and Aero-Space Engineering*, B.S., Massachusetts Institute of Technology, 1952; M.S., 1953; Ph.D., Carnegie Institute of Technology, 1961.

Lawrence L. Ambs, *Assistant Professor of Mechanical and Aero-Space Engineering*, B.S., University of Minnesota, 1960; M.S., 1962; Ph.D., 1967.

Maurice E. Bates, *Professor of Mechanical and Aero-Space Engineering*, B.S.E., Michigan, 1934; M.S., Massachusetts Institute of Technology, 1935; Ph.D., 1937.

Geoffrey Boothroyd, *Professor of Mechanical and Aero-Space Engineering*, B.S.E., University of London, 1957; Ph.D., 1962.

Duane E. Cromack, *Associate Professor of Mechanical and Aero-Space Engineering*, B.S. Massachusetts, 1959; M.E., Yale, 1961; D.Eng., Rensselaer Polytechnic Institute, 1968.

F. Erskine Crossley, *Professor of Mechanical and Aero-Space Engineering*, B.A., Cambridge University, 1937; M.A., 1941; D.Eng., Yale University, 1949.

Robert W. Day, *Professor of Mechanical and Aero-Space Engineering*, B.S., Massachusetts, 1948; M.M.E., Rensselaer Polytechnic Institute, 1954.

John H. Dittfach, *Professor of Mechanical and Aero-Space Engineering*, B.S.M.E., Minnesota, 1947; M.S.M.E., 1948.

John A. Fillo, *Associate Professor of Mechanical and Aero-Space Engineering*, B.S.M.E., Syracuse, 1959; M.S.M.E., 1962; Ph.D., 1966.

G. Horvay, *Professor of Mechanical and Aero-Space Engineering*, B.S., New York University, 1930; E.E., Columbia, 1931; Ph.D., 1939.

Robert H. Kirchhoff, *Assistant Professor of Mechanical and Aero-Space Engineering*, B.M.E., University of Santa Clara, 1961; M.S. University of Arizona, 1963; Ph.D., University of California, Berkeley, 1969.

Ramani Mani, *Assistant Professor of Mechanical and Aero-Space Engineering*, B.E., University of Bombay, 1963; M.S., California Institute of Technology, 1964; Ph.D., 1967.

Jon G. McGowan, *Assistant Professor of Mechanical and Aero-Space Engineering*, B.S., Carnegie Institute of Technology, 1961; M.S., Stanford, 1962; Ph.D., Carnegie Institute of Technology, 1965.

George A. McLennan, *Associate Professor of Mechanical and Aero-Space Engineering*, B.S., Carnegie Institute of Technology, 1957; M.S., University of Pittsburgh, 1958; Ph.D., Carnegie Institute of Technology, 1963.

Carl W. Nelson, *Assistant Professor of Metallurgy*, B.S., Case Institute of Technology, 1956; M.S., 1963; Ph.D., 1965.

Joseph M. O'Byrne, *Associate Professor of Mechanical and Aero-Space Engineering*, B.S.M.E., Cincinnati, 1950; M.E., 1952; M.S.M.E., Kentucky, 1952.

Robert K. Patterson, *Associate Professor of Mechanical and Aero-Space Engineering*, B.S., Maine, 1948; M.S., 1955.

Kenneth G. Picha, *Professor of Mechanical and Aero-Space Engineering, and Dean of the School of Engineering*, B.S., Georgia Institute of Technology, 1946; M.S., 1948; Ph.D., Minnesota, 1957.

Corrado R. Poli, *Associate Professor of Mechanical and Aero-Space Engineering*, B.S., Rensselaer Polytechnic Institute, 1957; M.S., 1958; Ph.D., Ohio State, 1965.

John E. Ritter, *Associate Professor of Materials Engineering*, B.S., Massachusetts Institute of Technology, 1961; M.S., 1962; Ph.D., Cornell, 1966.

G. Albert Russell, *Assistant Professor of Mechanical and Aero-Space Engineering*,

B.S., Massachusetts Institute of Technology, 1958; M.S., Arizona State, 1961; Ph.D., Connecticut, 1967.

John W. Zahradnik, *Professor of Biological Processing*, B.S. Pennsylvania State University, 1950; M.S., Iowa State University, 1951; Ph.D., Massachusetts Institute of Technology, 1965.

George E. Zinsmeister, *Associate Professor of Mechanical and Aero-Space Engineering*, B.S., Rensselaer Polytechnic Institute, 1961; M.S., Purdue, 1963; Ph.D., 1965.

The Master of Science Program in Mechanical Engineering is designed to meet the needs of students planning either doctoral study or professional employment. Thirty credit hours are required, six of which are to be earned by taking one course from any two of the following groups.

Group A MAE 603 Thermodynamics
MAE 606 Advanced Fluid Mechanics

Group B MAE 605 Advanced Solid Mechanics
MAE 607 Advanced Dynamics

Group C MAE 608 Physical Metallurgy Principles

Six credits of Mathematics are required, and a thesis or project of from six to nine credits is normally required. The remaining credits are electives for specialization in such areas as heat transfer, fluid mechanics, thermodynamics, dynamics and mechanics, machine or system design, propulsion, aero-dynamics, biological processing, and metallurgy or materials processing.

The Doctor of Philosophy program in Mechanical Engineering imposes no minimum credit hours but each course program must include the following elements:

a. Advanced and comprehensive study in the fundamentals of mechanical engineering including appropriate science courses in mathematics, physics, and chemistry;

b. Intensive study of a special discipline within mechanical engineering (for example, heat transfer, mechanics, gas or fluid dynamics, design, etc.) including study of the current literature;

c. *Either* intensive study of a second special discipline within mechanical engineering, including study of the current literature, *or* study in another discipline. The selection of this second discipline and the program of study is subject to approval by the student's Guidance Committee and by the Mechanical Engineering Graduate Committee but it is the intent of the option to allow and even encourage wide latitude in the selection of fields from engineering, science, social science, arts, or humanities.

A Qualifying Examination is required early in the program in addition to the Preliminary Examination required by the Graduate School. Also, each doctoral candidate prepares a thesis proposal for oral presentation to his Thesis Committee. Other requirements are the same as those imposed by the University and the Graduate School. The department requires that all doctoral candidates present reading knowledge in one foreign language sufficient to understand journal material.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS IN MECHANICAL AND AERO-SPACE ENGINEERING.

Special investigational or research problems, the scope to be varied to meet specific conditions.

Prerequisite, as required by the problem.

Credit, 1-6. Staff.

701. ADVANCED THERMODYNAMICS.

Selected topics in statistical thermodynamics, irreversible thermodynamics, and energy conversion.

Prerequisite, MAE 603 or equivalent.

Credit, 3. Mr. Dixon or Mr. McCowan.

703. AERODYNAMICS.

Application of theoretical fluid mechanics to aerodynamics including topics of theory of lift; finite wing theory; the effect of compressibility and viscosity on lift and drag; and slender body theory.

Prerequisite, MAE 574 or equivalent.

Credit, 3. Mr. Cromack.

704. PERFORMANCE, STABILITY AND CONTROL OF FLIGHT VEHICLES.

Development of equations of motion of a rigid body over the earth. Performance of flight vehicles in steady and non-steady flight paths. Static and dynamic stability and the aerodynamic effect using stability derivatives. Simulation and applications using linearized equations of motion.

Prerequisite, MAE 703.

Credit, 3. Mr. Cromack.

705. ADVANCED HEAT TRANSFER I.

Conduction — The laws of heat conduction, solution by analytical, numerical and graphical methods. Transform theory. The problem of fins. Radiation — Basic laws of radiation, geometry factor, the net radiation method. Radiation of absorbing media.

Prerequisite, MAE 582 or equivalent.

Credit, 3. Mr. Zinmeister.

706. ADVANCED HEAT TRANSFER II.

Convection — Similarity and dimensional analysis. Basic concepts of energy and mass flow. Forced convection in laminar and turbulent flow. Free convection, evaporation and boiling.

Prerequisite, MAE 606.

Credit, 3. Mr. Fillo.

707. VISCOUS FLUID I.

Derivation of the Navier-Stokes equations, pipe flow, Stokes flow, flow between cylinders, theory of lubrication, stagnation flow (2-3 dim.) Prandtl boundary layer theory — flat plate, Falkner-Skan equation, flow past a cylinder axially symmetrical and three dimensional boundary layers. Approximate methods of solution. Boundary layers in laminar and compressible flow. Introduction to turbulence.

Prerequisite, MAE 606 or equivalent.

Credit, 3. Mr. Fillo.

708. MAGNETOHYDRODYNAMICS.

Basic principles of electromagnetic fields, motion of charged particles, statistical behavior of plasmas. Conduction and diffusion in ionized gases. MHD flow equations, Alfven and shock waves. Exact solutions for MHD channel flows, quasi-one dimensional approximations. Boundary layers. MHD propulsion and power generations.

Prerequisite, MAE 707.

Credit, 3. Mr. Fillo.

709. MECHANICAL PROPERTIES OF MATERIALS.

Dislocation theory and its application to the mechanical properties of non-organic materials.

Prerequisite, MAE 608 or equivalent.

Credit, 3. Mr. Ritter or Mr. Nelson.

712. ADVANCED GAS DYNAMICS.

Higher approximations in the state equation of compressible fluids, calculation of aerodynamic forces, the phenomena of discontinuities and detonation, the effect of transfer processes and dispersions, and the interaction of electromagnetic fields. Illustrative examples, mathematical techniques, and experimental methods.

Prerequisite, MAE 605 or equivalent.

Credit, 3. Staff.

713. ADVANCED PROPULSION SYSTEMS.

Design, regulation and integration with the vehicle: air-breathing engines, chemical rocket motors, electrical and nuclear engines. Power and energy limited systems and various mission requirements.

Prerequisite, MAE 577 or equivalent.

Credit, 3. Staff

714. ADVANCED PROPULSION SYSTEMS II.

Seminar in Surface Oceanic and Aero-Space Propulsion Systems.

Prerequisite, MAE 713 or permission.

Credit, 3. Staff.

715. HIGH TEMPERATURE GAS DYNAMICS.

Flow of dissociated or ionized gases. Vibrational, Translational and radiative non-equilibrium. Waves and discontinuities.

Applications in energy generation and aircraft and missile engineering.

Prerequisite, graduate standing and permission of instructor. *Credit, 3. Staff.*

741. SHOCK AND VIBRATION.

Vibration of discrete systems with many degrees of freedom, normal modes and frequencies approximate methods. Free and forced vibrations of continuous systems, strings, rods, bars, etc.

Prerequisite, MAE 607 or equivalent.

Credit, 3. Staff.

742. NON-LINEAR MECHANICS.

Mechanical phenomena described by non-linear equations, Non-linearities in inertia, damping, restoring forces viscous flow, etc. Singular points and stability. Exact, approximate, graphical, and analog methods of solution. Self-excitation, sub-harmonic oscillations entrainment of frequency.

Prerequisite, MAE 607 or equivalent.

Credit, 3. Mr. Poli.

743. STABILITY OF STRUCTURES.

Correlations of various linear and non-linear theories with experiments. Creep buckling. Thermal buckling. Buckling due to dynamic loads. Buckling of non-conservative systems. Prerequisite, CE 745.

Credit, 3. Mr. Horvay.

744. THERMAL EFFECTS IN STRUCTURES.

Uncoupled thermoelastic theory, thermal stresses in beams, rings, plates, and shells. Thermally induced vibrations of beams, plates, and shells. Inelastic thermal stress problems. Stresses in the presence of creep. Ablation phenomena.

Prerequisite, graduate standing.

Credit, 3. Mr. Horvay.

745. ADVANCED CONTINUUM MECHANICS.

Cartesian tensors, analysis of stress in a continuum, analysis of deformation in a continuum, laws of motion of a continuous medium. Applications to solids and fluids.

Prerequisite, MAE 605.

Credit, 3. Mr. Horvay.

746. ADVANCED VIBRATIONS.

Free and forced harmonic vibrations of thin elastic plates; free vibrations of circular, cyl-

indrical, and conical shells. Forced harmonic vibrations of thin shells. Propagation of elastic waves, Rayleigh surface waves. Statistical concepts of random vibration analysis. Failure due to random vibration.

Prerequisite, MAE 742. *Credit, 3. Staff.*

747. INELASTIC BEHAVIOR OF MATERIALS.

Theory of perfectly plastic solids and elastoplastic solids. Strain-hardening materials. Linear viscoelastic solids. Nonlinear viscoelastic solids. Limit analysis of structures. Prerequisite, graduate standing.

Credit, 3. Mr. Horvay.

748. THEORY OF SHELLS.

Differential geometry of curves and surfaces; general orthogonal parametric representation theory; geometry of deformation, equations of equilibrium; non-linear theories; exact and approximate linear theories. Membrane shells; shells of revolution.

Prerequisite, MAE 548.

Credit, 3. Mr. Horvay.

749. STRUCTURAL MECHANICS OF DEEP SUBMERSIBLE VEHICLES (OE 763).

Elastic and inelastic action of pressure hull structures for deep submersible vehicles. Presentation of design criteria for stiffened shells and plating common to such systems. Prerequisites, MAE 246 or CE 141 and CE 240.

Credit, 3. Mr. Nash and/or Mr. Heronemus.

750. KINEMATIC SYNTHESIS IN DESIGN.

Geometry of constrained motion in two and three dimensions; applications to the synthesis of mechanisms. Coupler curves, Euler-Savory equation, Freudenstein's equation, Burmester theory.

Prerequisite, MAE 268 or equivalent.

Credit, 3. Mr. Patterson.

751. ADVANCED TOPICS IN MACHINE DESIGN.

Application of advanced theories to Machine Design and Kinematics. A variety of topics and considerable creative work.

Prerequisite, MAE 586 or equivalent.

Credit, 3. Mr. Bates.

758. VISCOUS FLUIDS II.

Continuation of MAE 707. Special topics according to student and instructor interest: three dimensional boundary layers for unsteady, compressible flow; boundary layer control; stability of laminar flow; jets and wakes; flow of non-Newtonian fluids.

Prerequisite, MAE 707.

Credit, 3. Mr. Fillo or Mr. Zinsmeister.

760. ADVANCED MECHANICAL ENGINEERING DESIGN I.

Application of modern advanced methods of design, including inventiveness, evaluation, and decision making, to the synthesis of thermal, fluid, mechanical, electromechanical, and combined systems. Consideration of optimization, reliability, and methods of simulation.

Prerequisite, MAE 601 or equivalent.

Credit, 4. Staff.

761. ADVANCED MECHANICAL ENGINEERING DESIGN II.

Continuation of MAE 760.

Prerequisite, MAE 760. *Credit, 4.* Staff.

770. ADVANCED COMBUSTION.

Topics in chemically reacting flow systems. An analysis of flames and detonations.

Prerequisite, graduate standing and permission of instructor. *Credit, 3.* Mr. Ambs.

780. ADVANCED MATERIALS PROCESSING I.

Advanced treatment of cutting and forming processes for materials. Automation and digital control.

Prerequisite, MAE 520.

Credit, 3. Mr. Boothroyd.

790. ENGINEERING PROJECT.

A research, design, or development project. Written preparation and oral defense of a project proposal giving objectives, literature survey, and proposed plan. Written preparation and oral defense of a final report giving results and conclusions. May be repeated for credit.

Prerequisite, graduate standing.

Credit, 1-10.

799. LITERATURE SURVEY AND SEMINAR.

A comprehensive study and organization of the current literature in a selected topic.

Presentation of the survey in an open seminar including Department faculty and graduate students. Open only to students who have passed Preliminary Examinations.

Not for credit. Staff.

800. MASTER'S THESIS. *Credit, 3-10.*

900. DOCTORAL DISSERTATION.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

520. MATERIALS PROCESSING.

Analysis of the metal cutting process including: mechanics of metal cutting; temperature generated; tool life and tool wear; cutting fluids and surface roughness; economics. Study of the grinding process and electrical machining process. Analysis of metal forming processes including wire drawing, extrusion, deep drawing rolling, blanking.

Credit, 3. Mr. Boothroyd.

521. AUTOMATION IN MANUFACTURING.

Fundamentals of parts feeding, orientation and mechanized assembly including analyses of transfer machines, parts feeders; the performance and economics of assembly machines.

Numerical control of machine tools including studies of control systems, planning procedures and economics.

Credit, 3. Mr. Boothroyd.

547. ADVANCED STRENGTH OF MATERIALS.

Advanced topics in strength of materials of interest to Mechanical and Aero-Space Engineers.

Prerequisite, MAE 145. *Credit, 3.* Staff.

548. AERO-SPACE STRUCTURES.

Flight loads, aerodynamic heating, thermal effects in flight structures, analysis and design of structural components of flight vehicles, hypersonic flight vehicles structures. Prerequisite, MAE 145. *Credit, 3.* Staff.

554. PRODUCT DESIGN I.

Human values in design. Central philosophy of product design, with emphasis on the re-

lation between technical and human values, creativity, and design methodology. Laboratory includes the development of simple product concepts visualized in rapidly developed three-dimensional mockups. Two class hours, two 2-hour laboratory period. *Credit, 3. Mr. Umholtz.*

555. AQUACULTURAL ENGINEERING SYSTEMS (OE 591).

Rate theory and similitude in the scaling of biological processes. Case study if biological data used in the derivation of useful engineering system design relationships for the culture of mollusks. A bio-engineering comparison of several systems used in aquaculture. *Credit, 3. Mr. Zahradnik.*

557. PRODUCT DESIGN II.

Continuation of MAE 554. Integration of knowledge, methodology, and skills obtained in previous work applied and extended to product design. Semester-long design project with formal presentation to professional jury. Prerequisite, MAE 554. Two class hours, two 2-hour laboratory periods. *Credit, 3. Mr. Umholtz.*

570. ASTRODYNAMICS.

Introduction to celestial mechanics, orbits, powered and space flight trajectories. Gyroscopes. Analysis of vehicle motion including static and dynamic stability. Prerequisite, MAE 246. *Credit, 3. Staff.*

574. PERFORMANCE OF FLIGHT VEHICLES.

Theoretical and experimental aspect of lift and drag of aerodynamic components and flight vehicles as a system. Static and maneuvering performance of aircraft and an introduction to stability and control. A general aircraft performance analysis is required. Prerequisite, a course in fluid mechanics. *Credit, 3. Mr. Cromack.*

576. COMBUSTION.

Phenomenological study of combustion processes in flowing systems. Prerequisite, MAE 264. *Credit, 3. Mr. Ambbs.*

577. INTERNAL COMBUSTION ENGINES.

The thermodynamic and performance aspects of reciprocating gasoline and Diesel engines, steady flow gas turbines and turbo-jet engines, and rockets are major topics. Prerequisite, MAE 264. *Credit, 3. Mr. Dittfach.*

578. AERO-SPACE PROPULSION.

Primary and auxiliary power sources. Matching of air-breathing and rocket motors with vehicle. Electrical and nuclear propulsion systems. Prerequisite, MAE 287. *Credit, 3. Mr. Ambbs.*

582. HEAT TRANSFER.

Methods of evaluating heat transfer rates and predicting operating temperatures. Heat transfer by conduction, radiation, and convection. Topics include one- and two-dimensional conduction, heat flow, transient heat fins, numerical and graphical solutions, free and forced convection and radiation. Prerequisites, MAE 264 and Math 186 or 541. *Credit, 3. Mr. O'Byrne and Mr. Zinsmeister.*

583. MACHINE DESIGN.

Principles of the design of various machine parts; economy of manufacture, safety, styling, invention and creativity. Two class hours, one 3-hour laboratory period. Prerequisites, MAE 293, 235 and 237. *Credit, 3. Staff.*

585. VIBRATIONS I.

Elements of vibration theory, vibration isolation, absorbers, instrumentation, analysis of equivalent masses and shaft systems. Dynamic balancing. Prerequisite, MAE 246. *Credit, 3. Staff.*

586. ADVANCED MACHINE DESIGN.

Continuation of MAE 563. Additional elementary parts are analyzed, and some complete machines are studied. Considerable emphasis on invention and creativity. Two class hours, one 3-hour laboratory period. Prerequisite, MAE 583. *Credit, 3. Mr. Bates.*

587. GAS DYNAMICS.

Continuation of MAE 265. Continuous and discrete media. Compressible flow equations and compressibility effects. Flow in variable area ducts, normal and oblique shocks. Two dimensional flow. Applications.

Prerequisites, MAE 265 and MAE 263.

Credit, 3. Mr. Day.

591. MECHANICAL AND AERO-
SPACE ENGINEERING
ANALYSIS II.

Continuation of MAE 284 with emphasis on more complex problems and more advanced mathematical methods.

Two class hours, one 3-hour laboratory period.

Prerequisite, MAE 284. *Credit, 3. Staff.*

594. MECHANICAL AND AERO-
SPACE SYSTEMS ANALYSIS.

Application of engineering analysis techniques to large scale systems. Concepts and methodology of systems engineering.

Prerequisite, EE 142 or permission of instructor. *Credit, 3. Staff.*

595. MECHANICAL AND AERO-
SPACE ENGINEERING
DESIGN.

Application of fundamentals of technology to complex design projects.

One class hour, two 3-hour laboratory period. *Credit, 3. Staff.*

601. ADVANCED ENGINEERING
ANALYSIS AND DESIGN.

An integration of fundamental physical laws with mathematical theory. Utilization of physical principles in a rigorous study of analysis and design methods in engineering. Application of graphical, numerical, and mathematical methods to realistic problems is emphasized.

Prerequisite, graduate standing or permission of instructor. *Credit, 3. Staff.*

603. THERMODYNAMICS.

Review of Classical Thermodynamics and conventional energy conversion. Statistical Thermodynamics. Introduction to Irreversible Thermodynamics and direct energy conversion.

Prerequisite, graduate standing or permission of instructor. *Credit, 3. Staff.*

604. STATISTICAL THERMO-
DYNAMICS.

An analysis of thermodynamics from the microscopic approach. Divided equally among statistical thermodynamics, kinetic theory of gases and transport properties of gases.

Prerequisites, MAE 263 or MAE 603.

Credit, 3. Staff.

605. ADVANCED SOLID
MECHANICS.

A unified treatment of the analysis of solids. Consideration of continuity, mechanical energy, stress and strain. Application to elasticity, thermoelasticity, and plasticity.

Prerequisite, graduate standing or permission of instructor. *Credit, 3. Staff.*

606. ADVANCED FLUID
MECHANICS.

Review of kinematics of fluids and fluid dynamics; inviscid fluids, viscous fluid dynamics; incompressible, laminar flows; introduction to boundary layer theory.

Prerequisite, MAE 265 or equivalent.

Credit, 3. Mr. Fillo.

607. ADVANCED DYNAMICS.

Advanced dynamics of particles, systems of particles, variable mass systems, and rigid bodies. Gyroscopic motion. Rotating and accelerating frames of reference. Use of energy methods, LaGrange's equations, Hamilton's principle, and Eulerian angles in engineering problems.

Prerequisite, graduate standing or permission of instructor. *Credit, 3. Staff.*

608. PHYSICAL METALLURGY
PRINCIPLES.

Principles underlying the structure and behavior of metals. Atomic arrangements crystalline imperfections and X-ray. Equilibrium and non-equilibrium phase relationships in one-, two-, and three-component systems. Kinetics of diffusion and nucleation. Phase transformations, heat treatment and hardenability.

Prerequisite, graduate standing or permission of instructor.

Credit, 3. Mr. Ritter and Mr. Nelson.

650. X-RAY DIFFRACTION.

Principles of crystallography. X-ray diffrac-

tion.

Prerequisite, MAE 608.

Credit, 3. Mr. Nelson and Mr. Ritter.

Microbiology

GRADUATE FACULTY

Charles D. Cox, *Head of the Department and Professor of Microbiology*, B.S., Illinois, 1940; M.S., 1941; Ph.D., 1947.

Erole Canale-Parola, *Associate Professor of Microbiology*, B.S., Illinois, 1956; M.S., 1957; Ph.D., 1961.

Clifton E. Dowell, Jr., *Associate Professor of Microbiology*, B.A., Texas Christian University, 1955; M.A., 1957; Ph.D., University of Texas, 1962.

Stanley C. Holt, *Assistant Professor of Microbiology*, B.S., New York University, 1958; M.S., Michigan State, 1960; Ph.D., California at Davis, 1964.

Thomas G. Lessie, *Assistant Professor of Microbiology*, B.S., Queens College, 1958; A.M., Harvard, 1961; Ph.D., 1963.

Robert P. Mortlock, *Associate Professor of Microbiology*, B.S., Rensselaer Polytechnic Institute, 1953; Ph.D., Illinois, 1958.

Charles J. Pfau, *Assistant Professor of Microbiology*, B.S., Rensselaer Polytechnic Institute, 1956; M.S., Indiana University, 1958; Ph.D., 1960.

Albey M. Reiner, *Assistant Professor of Microbiology*, B.S., Princeton, 1962; M.S., Wisconsin, 1964; Ph.D., Harvard, 1968.

Curtis B. Thorne, *Professor of Microbiology*, B.S., West Virginia Wesleyan, 1943; M.S., Wisconsin, 1944; Ph.D., 1948.

Martin S. Wilder, *Assistant Professor of Microbiology*, B.S., Brooklyn College, 1960; M.S., University of Kansas, 1963; Ph.D., 1966.

ASSOCIATED FIVE-COLLEGE GRADUATE FACULTY

Edward R. Leadbetter, *Professor of Biology*, (Amherst College), B.S., Franklin and Marshall, 1955; Ph.D., University of Texas, 1959.

Elizabeth D. Robinton, *Associate Professor of Biology*, (Smith College), B.S., Columbia Teacher's College, 1938; M.A., Smith, 1948; Ph.D., Yale, 1950.

UNIVERSITY OF MASSACHUSETTS/BOSTON GRADUATE FACULTY.

Edna Seaman, *Assistant Professor of Biology*, B.A., Brooklyn College, 1956; Ph.D., University of Illinois, 1960.

The Department of Microbiology provides facilities for students intending to complete the requirements for the Master of Science and Doctor of Philosophy degrees. Students accepted for graduate study are expected to have met the usual requirements for the Bachelor's degree. Those students considered by the Department to be deficient in cognate sciences and a foreign language may be accepted as graduate student majors in microbiology and their deficiencies removed during graduate study. Extensive advanced undergraduate courses in microbiology are not as essential as undergraduate background in chemistry, biological sciences, mathematics and physics, in preparation for graduate work in microbiology. Satisfactory knowledge of microbiology and cognate sciences is required for admission to advanced courses in microbiology. The department requires no foreign language reading competency for the doctorate.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or Minor credit)

700. RESEARCH.

Not for thesis credit, but normally for research preliminary to registration for thesis credit. May be repeated for a total of no more than 9 credits for a Master's degree or 18 credits for a Doctor's degree.

Permission of instructor required.

Credit, 2-6 each semester. Staff.

710. ADVANCED IMMUNOLOGY.

Advanced theories and laboratory procedures basic to immunology and serology.

Permission of instructor required.

Credit, 3-6. Mr. Cox.

720. MAMMALIAN VIROLOGY.

The structure, and the chemical, physical and biological properties of viruses with emphasis on mammalian viruses. Laboratory treatment includes technics of propagation and study, including tissue culture.

Permission of instructor required.

Credit, 4. Mr. Pfau.

730. MICROBIAL FERMENTATIONS.

Theories, methods, and processes by which various chemicals and biological materials are produced industrially through the action of microorganisms. The laboratory experiments consider the microorganisms involved, procedures used, and the chemistry of the fermentation reactions.

Permission of instructor required.

Credit, 3. Staff.

740. ADVANCED MICROBIAL PHYSIOLOGY.

Primarily laboratory. Growth of bacteria in batch and continuous culture; macromolecular composition of bacteria grown under different conditions; bacterial respiration and electron transport systems; fractionation and characterization of bacterial enzymes with emphasis on regulation of their formation and activity.

Permission of instructor required.

Credit, 2-5. Mr. Lessie, Mr. Mortlock.

750. MICROBIAL CYTOLOGY.

Lectures, literature reviews, and laboratory, designed to give the student a comprehensive survey of the structure of microbial cells and the functions of their components.

Permission of instructor required.

Credit, 3-5. Mr. Holt.

760. MICROBIAL METABOLISM.

Metabolic pathways and mechanisms in microorganisms. Lectures, readings and discussions.

Permission of instructor required.

Credit, 3. Mr. Mortlock.

770. MICROBIAL GENETICS.

Inheritance and variation in microorganisms. Mechanisms of recombination, transduction, and other genetic phenomena in microorganisms, with emphasis on molecular basis.

Permission of instructor required.

Credit, 4. Mr. Thorne.

780. HOST-PARASITE RELATIONSHIPS.

Intensive treatment of specific relationships between parasitic microorganisms and their hosts, by appropriate literature and laboratory studies.

Permission of instructor required.

Credit, 2-5. Mr. Wilder.

790. SEMINAR.

Reports and discussions of pertinent literature. Normally required of all graduate majors each semester in residence.

Permission of instructor required.

Credit, 1. Staff.

800. MASTER'S THESIS.

Credit, 10.

890. CURRENT TOPICS.

Intensive consideration of a specific microbiological topic of current interest, utilizing staff and student participation and visiting scientists. Lectures and discussions only. Credit depends upon particular topic each semester given.

Permission of instructor required.

Credit, 1-2. Staff.

900. DOCTORAL DISSERTATION.

Credit, 30.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

550. GENERAL MICROBIOLOGY.

General consideration of microbial structure, growth and physiology, and the reactions of microorganisms to their physical, chemical and biological environments. Designed for students intending to take more advanced courses in microbiology and other science majors.

Two class hours, two 3-hour laboratory periods.

Prerequisites, Chem 262, 166 or 160 and one semester of biological science.

Credit, 4. Mr. Canale-Parola,
Mr. Mortlock.

560. MICROBIAL DIVERSITY.

Principles of selective enrichment and isolation; morphological, physiological and

ecological characteristics of a number of microbial groups isolated from nature.

Two class hours, two 3-hour laboratory periods.

Prerequisite, Microbiol 550.

Credit, 4. Mr. Canale-Parola.

580. PATHOGENIC BACTERIOLOGY.

Correlation of physiological and morphological properties of bacteria with virulence and pathogenesis of disease.

Prerequisite, Microbiol 550.

Credit, 4. Mr. Wilder.

610. IMMUNOLOGY.

The nature of antigens and antibodies, their interactions and significance in resistance and hypersensitivity.

Two class hours, two 3-hour laboratory periods.

Prerequisite, Microbiol 550.

Credit, 4. Mr. Cox.

620. VIROLOGY.

The structure, and the chemical, physical and biological properties of viruses.

Two class hours, two 3-hour laboratory periods.

Prerequisites, Microbiol 550, permission of instructor.

Credit, 4. Mr. Pfau.

640. MICROBAL PHYSIOLOGY.

Microbial chemistry and growth. Composition of bacterial cells, energy metabolism, biosynthesis of macromolecules and macromolecule precursor materials, and regulatory mechanisms governing these events.

Permission of instructor required.

Credit, 3. Mr. Mortlock, Mr. Lessie.

Music

GRADUATE FACULTY

Philip Bezanson, *Head of the Department and Professor of Music*, Mus.B., Yale School of Music, 1940; M.A., University of Iowa, 1948; Ph.D., 1951.

Richard du Bois, *Associate Head of Department and Associate Professor of Music*, Mus.B., Heidelberg College, 1948; M.M., American Conservatory of Music, 1949; Ph.D., University of Iowa, 1964.

John R. King, *Professor of Music*, B.A., Cambridge University, 1935; Mus.B., 1935; M.A., 1939; Ph.D., University of Toronto, 1950.

Robert Stern, *Associate Professor of Music*, B.A., University of Rochester, 1955; M.A., Eastman School of Music, 1956; Ph.D., 1962.

A minimum of thirty-three hours and a comprehensive oral examination are required for the Master of Music degree. A basic core of courses in music is required of all degree candidates. Additional hours in music and electives will be required according to the area of concentration and on the advice of the area adviser. Candidates may concentrate in one of the following areas: applied music, music education, musicology, theory-composition.

Candidates for the M.M. in Composition must submit one original composition in large form (chamber music, orchestral, choral with instruments, or the like) in lieu of a research thesis.

Applicants for admission are required to audition on their major instrument and take a placement examination.

COURSES OPEN TO GRADUATE STUDENTS ONLY

700. SPECIAL PROBLEMS. *Credit, 1-6.*

701, 702. SEMINAR IN MUSICOLOGY.

Materials and methods of systematic and historical musicology. Specialized topics investigated each semester. The application to different problems of various subjects such as acoustics, aesthetics, analysis. May be repeated for credit with varying content, as advised.

Credit, 3.

710. COUNTERPOINT (Canon and Fugue).

Writing and analysis of invertible counterpoint, various canonic devices and fugue.

Credit, 3.

711, 712. COMPOSITION.

Free composition in various forms and media. Individual lessons. Weekly seminar.

Credit, 3.

713-716. ANALYSIS OF MUSIC
LITERATURE.

Representative compositions from each period. Analysis by score and sound of the various musical forms and media. Offered on a rotation basis of period courses as follows:

Credit, 3.

713. ANALYSIS OF MUSIC
LITERATURE, 1600-1750.

714. ANALYSIS OF MUSIC
LITERATURE, 1750-1825.

715. ANALYSIS OF MUSIC
LITERATURE, 1825-1900.

716. ANALYSIS OF MUSIC
LITERATURE, 1890-PRESENT.

717. HISTORY AND PEDAGOGY
OF THEORY.

Principal authors of treatises dealing with composition, counterpoint, and harmony, with emphasis on the relationship between the works discussed and contemporary pedagogical techniques of presenting theory and allied subjects.

Credit, 3.

721-738. APPLIED MUSIC
INDIVIDUAL INSTRUCTION.

Literature and instrumental technique or voice production.

Credit, 1-4.

721. APPLIED PIANO.

722. APPLIED ORGAN.

723. APPLIED VOICE.

724. APPLIED VIOLIN.

725. APPLIED VIOLA.

726. APPLIED CELLO.

727. APPLIED BASS.

728. APPLIED FLUTE.

729. APPLIED OBOE.

730. APPLIED CLARINET.

731. APPLIED BASSOON.

732. APPLIED SAXOPHONE.

733. APPLIED TRUMPET.

734. APPLIED FRENCH HORN.

735. APPLIED TROMBONE.

736. APPLIED BARITONE HORN.

737. APPLIED TUBA.

738. APPLIED PERCUSSION.

741. SUPERVISION AND ADMIN-
ISTRATION OF MUSIC.

The function of the music supervisor and administrative problems in public school.

Credit, 3.

742. RESEARCH IN MUSIC
EDUCATION.

Individual research projects in selected areas of Music Education.

Credit, 3.

751. GENERAL MUSIC IN THE
ELEMENTARY SCHOOL.

Study and evaluation of contemporary methods and materials of general music in the elementary school.

Credit, 3.

752. INSTRUMENTAL MUSIC IN
THE PUBLIC SCHOOL.

Organization of the instrumental program from the Elementary through the Senior High School. Materials and methods of solo, class, and large ensemble instruction.

Credit, 3.

753. CHORAL MUSIC IN THE
PUBLIC SCHOOL.

Organization of the choral program in the Junior and Senior High School. Materials and methods of teaching small and large vocal ensembles.

Credit, 3.

800. MASTER'S THESIS. *Credit, 3-10.*

COURSES OPEN TO BOTH
GRADUATE AND UNDER-
GRADUATE STUDENTS

014. REMEDIAL THEORY.

For graduate students who are deficient in undergraduate theory. The materials presented are adapted to individual requirements.

Credit, 0.

503. MUSIC HISTORY—MUSIC
FROM MONTEVERDI
TO BACH.

The Baroque and Rococo periods, including the music of such composers as Monteverdi,

Schütz, Lully, Purcell, Corelli, Couperin, Rameau, the Scarlattis, Bach, Handel.

Credit, 3.

505. MUSIC HISTORY—
MEDIEVAL AND
RENAISSANCE MUSIC.

Chant and organum through Renaissance motet and madrigal. Reading, listening, score study, analysis. *Credit, 3.*

509. MUSIC HISTORY—MUSIC OF
THE 20TH CENTURY.

Music, both European and American, written since 1900, including Stravinsky, Bartok, Hindemith, Copland, jazz, electronic music. *Credit, 3.*

601. MUSIC HISTORY—HAYDN
MOZART, AND BEETHOVEN.

Reading, listening, score study. Besides music of Haydn, Mozart, and Beethoven, that of their contemporaries may also be included. *Credit, 3.*

602. MUSIC HISTORY—MUSIC
FROM SCHUBERT TO
DEBUSSY.

Historical study of 19th Century music in small and large forms, and various media including Lied, chamber music, symphony, opera. Reading, listening, score study. *Credit, 3.*

603. MUSIC HISTORY—HISTORY
OF OPERA.

History of Opera from the late 16th through the present Century. *Credit, 3.*

515. COUNTERPOINT.

Techniques of counterpoint, and analysis of polyphonic music of the 16th Century. Composition in small forms, utilizing contrapuntal techniques. *Credit, 3.*

516. ORCHESTRATION.

Problems in scoring for various ensembles including full orchestra. *Credit, 3.*

517. CONTEMPORARY TECH-
NIQUES.

Examination of melody, rhythm, harmony, and form in 20th Century music. Analysis, listening, written assignments. *Credit, 2.*

525. MARCHING BAND TECH-
NIQUES.

Organization, training and repertoire for the high school and college marching band. Charting of drills, formations and continuity. *Credit, 2.*

526. ADVANCED CHORAL LITERA-
TURE AND TECHNIQUES.

Historical survey of choral literature and the study of performance practices. *Credit, 3.*

527. ADVANCED ORCHESTRAL
LITERATURE AND TECH-
NIQUES.

Historical survey of orchestral literature and the study of performance practices. *Credit, 3.*

528. ADVANCED BAND LITERA-
TURE AND TECHNIQUES.

Historical survey of wind ensemble and band literature and the study of performance practices. *Credit, 3.*

PERFORMING ORGANIZATIONS

761. UNIVERSITY CHORALE.

A cappella choir selected by audition. Preparation and performance of choral literature ranging from the Renaissance to contemporary music. Performances on campus and on concert tours. Three rehearsals a week. Chamber Singers selected from this group. *Credit, 1.*

762. UNIVERSITY CHORUS.

Open to all students. Preparation and concert performance of oratorios and other large choral works. *Credit, 1.*

765. WOMEN'S CHOIR.

A select choir specializing in literature for women's voices. Audition required. *Credit, 1.*

767. CHAMBER SINGERS.

Vocal ensembles specializing in performance of chamber music from Renaissance to contemporary music. Audition required. *Credit, 1.*

768. MADRIGAL SINGERS.

Vocal ensemble specializing in music of the Renaissance. Audition required. *Credit, 1.*

771. UNIVERSITY ORCHESTRA.

Preparation and performance of orchestral literature of various styles and periods.

Credit, 1.

781. MARCHING BAND.

Preparation and performance of pre-game and half-time shows during the football season.

May be taken one semester, with a semester of Music 782 or 783, or for two semesters.

Credit, 1.

782. SYMPHONY BAND

Preparation and performance of band and wind ensemble literature of various styles and periods.

May be taken one semester, with a semester of Music 781 or 783, or for two semesters.

Credit, 1.

783. CONCERT BAND.

Preparation and limited performance of selected band literature.

May be taken one semester, with a semester of Music 781 or 782, or for two semesters.

Credit, 1.

787. ENSEMBLE.

Preparation and performance of appropriate literature for small instrumental and vocal ensembles.

Credit, 1.

Nursing

GRADUATE FACULTY

Virginia Earles, *Professor of Medical-Surgical Nursing*, B.S.N., Syracuse University, 1950; M.S., 1954.

Lillian R. Goodman, *Acting Dean and Professor of Nursing*, R.N., Peter Bent Brigham Hospital School of Nursing, 1948; B.S., Boston University, 1950; M.S., 1954; Ed.D., 1969.

May B. Hall, *Assistant Professor of Psychiatric-Mental Health Nursing*, R.N., St. Barnabas Hospital for Women and Children, 1939; B.S., Marquette University, 1951; M.S., Boston University, 1953.

Mary E. Helming, *Professor of Nursing*, R.N., Massachusetts General Hospital School of Nursing, 1940; B.S., Simmons College, 1948; M.S.N., The Catholic University of America, 1954.

Anne Lee, *Lecturer in Research*, A.B., University of Pennsylvania, 1950; Ph.D., 1966.

Hildegard Salenius, *Associate Professor of Psychiatric-Mental Health Nursing*, R.N., St. Lukes & Children's Medical Center, 1948; B.S., University of Denver, 1956; M.S., University of Colorado, 1958; D.N.Sc., Boston University, 1965.

Loretta R. Sharp, *Associate Professor of Pediatric Nursing*, B.S.N., University of Colorado, 1944; M.A., University of Chicago, 1954.

Alvin Winder, *Professor of Psychology*, B.A., Brooklyn College, 1947; M.S., University of Illinois, 1948; Ph.D., University of Chicago, 1952.

The program has been developed in consideration of four broad areas: first, the character of baccalaureate education in nursing which emphasizes the preparation of a generalist; second, the changing needs of society in regard to nursing which are intimately related to the rapid advances in medical practice, based upon the explosion of knowledge in the natural sciences; third, the imperative need for the development of theoretical content for the profession of nursing based upon research and other scholarly pursuits; and fourth, the need for the development of leadership personnel who have new knowledge, new insights and concepts, and who are prepared to cope with the constantly changing functions and roles of the professional nurse.

The first three semesters emphasize advanced study in clinical nursing, both theory and practice, and advanced study of the natural and behavioral sciences, and an introduction to research methodology. In the fourth semester, the student may elect to concentrate in one of the functional areas—supervision and administration of nursing, or the teaching

of nursing. Concurrent field practice is provided in both areas. As a third alternative, the student may choose to continue clinical study, concentrating in greater depth in some specialized area of the field.

Candidates for admission, in addition to the minimum Graduate School requirements, must present evidence of:

a. Graduation from a baccalaureate program in nursing accredited by the National League for Nursing.

b. Evidence of academic ability, on the basis of the Miller Analogy or the Graduate Record examination.

c. Professional references indicating expectation of success in a graduate program.

Requirements for the Master's Degree in Nursing:

1. Total credits—48, of which a minimum of 36 are in combined clinical nursing and related behavioral and natural sciences and research. The remaining 12 credits may be in one of the functional areas of administration or teaching of nursing or may be devoted to the study of a specialized area in the clinical field.

2. Field practice is required of all students who elect a concentration in administration or teaching in the fourth semester.

3. A field study (Nursing 700. Problems) in a selected area of nursing must be completed by all students.

COURSES OPEN TO GRADUATE STUDENTS OF NURSING ONLY

700. PROBLEMS IN NURSING.

Independent study, including the completion of a field study of a selected problem in nursing, under guidance of a faculty adviser. *Credit, 3.*

703. MEDICAL-SURGICAL NURSING I.

Theoretical framework for application of the behavioral sciences to enhance the therapeutic process through nurse-patient

interaction, to gain understanding of the dynamics of behavior in illness and to solve clinical problems. *Credit, 3.*

704. MEDICAL-SURGICAL NURSING II.

Principles of the biological and physical sciences pertinent to the designation and implementation of highly skilled patient care. Includes depth analysis of clinical data with emphasis on definition of the scientific basis for nursing action. *Credit, 3.*

705. MEDICAL-SURGICAL NURSING III.

A seminar in clinical nursing devoted to identification of research themes in nursing and medicine, development of theoretical concepts of nursing based on research and clinical study and identification of research questions relevant to nursing practice. *Credit, 6*

706. MEDICAL-SURGICAL NURSING IV.

Guided study designed for the individual student to provide opportunity for development of special skills in nursing, specialization in study of content and pursuit of research interests. *Credit, 6–12.*

708. SEMINAR IN RESEARCH IN NURSING.

An introduction to research design and methods and their application to nursing problems. *Credit, 3.*

751. SEMINAR IN NURSING ADMINISTRATION.

The leadership role of the nursing administrator in the context of various theories of management and organization. Emphasis on the processes of policy formulation and decision making and the administrator's role as a change agent in determining the character and quality of clinical nursing in an agency. Analysis of administrative problems encountered in concurrent field practice. Concurrent requisites—course in Administrative Theory, and Nursing 761. *Credit, 3.*

761. FIELD PRACTICE IN

NURSING ADMINISTRATION.

Under guidance of the faculty adviser and the preceptor in the agency, experiences are selected in various hospital units that will enable the student to experience and to analyze some of the administrative problems related to provision of direct nursing care. Opportunity is provided to participate in the major activities and to carry selected responsibilities of either the administrator of a clinical department or the director of nursing services, depending upon the student's background.

Concurrent requisite—Nursing 751.

Credit, 6.

762. PRACTICUM IN TEACHING.

Experience in teaching in the classroom and clinical setting. Emphasis is on experience and critical evaluation of the range of teaching methods cogent to a professional field.

Credit, 3-6.

Nutrition and Food

GRADUATE FACULTY

Mark H. Bert, *Director of Graduate Studies and Associate Professor of Nutrition and Food*, B.S., Lima University, Peru, 1939; M.S., Illinois, 1948; Ph.D., 1955.

Donald L. Anderson, *Associate Professor of Animal Science*, B.S., Massachusetts, 1950; M.S., Connecticut, 1952; Ph.D., Cornell, 1955.

Virginia A. Beal, *Associate Professor of Nutrition and Food*, B.S., Simmons College, 1939; M.P.H., Harvard School of Public Health, 1945.

Heinrich Fenner, *Assistant Professor of Animal Science*, B.S., Agricultural College of Stuttgart-Hohenheim, 1951; Ph.D. 1956.

Sidney L. Lyford, Jr., *Assistant Professor of Animal Science*, B.S., New Hampshire, 1958; M.S., North Carolina State College, 1960; Ph.D., 1964.

The degree of Master of Science or of Doctor of Philosophy may be earned in the Department by candidates who hold

an accredited baccalaureate degree in Home Economics with a major in Dietetics or Nutrition and Food, or an accredited baccalaureate degree in natural sciences with emphasis on chemistry and biology. Students must be prepared to remedy undergraduate deficiencies without earning graduate credit.

Candidates must satisfy the M.S. or Ph.D. degree requirements established by the University. The program for each candidate for the M.S. degree is designed to meet the needs and interests of the student, and includes either a thesis or a written report on his work on a special problem.

The program for each candidate for the Ph.D. degree is designed with sufficient flexibility to meet the needs and interests of the student; it includes course work in the major field and in areas related to the major field, a written preliminary comprehensive examination and a dissertation. The Department requires no foreign language reading competency for the Ph.D. degree.

Applications for assistantships must be received by March 1 if applicants seek to begin their studies in the following fall.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

421. DEVELOPMENTS IN NUTRITIONAL EDUCATION.

Interpretation and application of changing and new concepts of nutrition—its place in schools and health programs.

Prerequisite, three credits in a biological science. *Credit, 3.* Miss Wright.

700. SPECIAL PROBLEMS IN NUTRITION OR FOOD.

Prerequisite, permission of department head. *Credit, 3-6.*

703. ADVANCED NUTRITION — METABOLISM OF MAJOR FOODSTUFFS.

Metabolic role of carbohydrates, lipids, proteins and amino acids; biological oxidations; mechanisms of energy production and utili-

zation. Offered fall.

Prerequisite, Biochem 520 or permission of instructor. *Credit, 3.* Mr. Bert.

704. ADVANCED NUTRITION — VITAMINS.

Metabolic role of vitamins, specific functions, requirements, sources, assay methods, effects of deficiencies and excesses.

Prerequisite, NF 703 or permission of instructor. *Credit, 3.* Mr. Bert.

705. ADVANCED NUTRITION — MINERALS.

Metabolic role of minerals, specific functions, requirements, sources, assay methods, effects of deficiencies and excesses.

Prerequisite, NF 703 or permission of instructor.

Credit, 3. Mr. Bert and Mr. Fenner.

710. SEMINAR.

Readings, reports, and discussions on the current literature in the area of Food or Nutrition.

Credit, 1-3. Maximum Credit, 6.

800. MASTER'S THESIS.

Individual research. *Credit, 6-10.*

801. RESEARCH PROJECT.

Prerequisite, permission of department head.

(Not thesis; for Ph.D. candidates only)

Credit, 1-4.

900. DOCTORAL DISSERTATION.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

651. INSTITUTIONAL ADMINISTRATION.

Principles of organization, management, sanitation, food service planning, and equipment selection. Three field trips.

Prerequisite, NF 251 or 156.

Credit, 4. Mrs. McCullough.

652. HUMAN NUTRITION.

Absorption, utilization, and interrelationship of food nutrients. Factors and critique of methods for determining nutrient requirements.

Prerequisites, NF 127, 251, Biochem 520,

Zool 135 or permission of instructor.

Credit, 3. Mr. Bert or Mrs. Umapathy.

660. EXPERIMENTAL FOODS.

Fundamental principles of food quality evaluation; development of an independent research problem.

One class hour, two 3-hour laboratories.

Prerequisites, NF 251, Chem 160 or permission of instructor.

Credit, 3.

673. NUTRITION DURING GROWTH AND DEVELOPMENT.

Nutrition as it affects physical growth and development. Criteria for evaluating nutritional status of children.

Prerequisite, NF 127 or 352.

Credit, 3. Miss Beal.

675. NUTRITION IN DISEASE.

Physiological basis for therapeutic diets in certain diseases. Current medical and nutrition literature used.

Prerequisites, Biochem 520, Zool 135, NF 130, 352, or permission of instructor.

Credit, 3. Miss Wright.

Ocean Engineering

GRADUATE FACULTY

Stanley M. Bemben, *Associate Professor of Civil Engineering*, B.S., Massachusetts, 1956; M.S., Illinois, 1958; Ph.D., Cornell, 1966.

Charles E. Carver, Jr., *Professor of Civil Engineering*, B.S.C.E., Vermont, 1947; M.S.C.E., Massachusetts Institute of Technology, 1949; Sc.D., 1955.

Joseph M. Colonell, *Associate Professor of Civil Engineering*, B.S.C.E., Colorado, 1958; M.S.C.E., Washington State, 1960; Ph.D., Stanford, 1966.

Duane E. Cromack, *Associate Professor of Mechanical and Aero-Space Engineering*, B.S., Massachusetts, 1959; M.E., Yale, 1961; D.Eng., Rensselaer Polytechnic Institute, 1968.

Frederick J. Dzialo, *Associate Professor of Civil Engineering*, B.S.C.E., Massachusetts, 1954; M.S.C.E., 1959; Ph.D., Rensselaer Polytechnic Institute, 1965.

- Denton B. Harris, *Assistant Professor of Civil Engineering*, B.S.C.E., Massachusetts, 1952; M.S.C.E., 1953.
- William E. Heronemus, *Professor of Civil Engineering*, B.S., U.S. Naval Academy, 1942; M.S., Massachusetts Institute of Technology, 1948.
- Francis S. Hill, Jr., *Assistant Professor of Electrical Engineering*, B.S.E.E., Yale, 1962; M.S.E.E., 1964; Ph.D., 1968.
- Charles E. Hutchinson, *Professor of Electrical Engineering*, B.S., Illinois Institute of Technology, 1957; M.S., Stanford, 1961; Ph.D., 1963.
- Ernest E. Lindsey, *Professor of Chemical Engineering*, B.S., Georgia Institute of Technology, 1936; D.Eng., Yale, 1940.
- Peter A. Mangarella, *Assistant Professor of Civil Engineering*, B.S., Carnegie-Mellen, 1965; M.S., Stanford, 1966; Ph.D., 1970.
- Melton M. Miller, Jr., *Associate Professor of Civil Engineering*, B.S.C.E., Vermont, 1955; M.S.C.E., Purdue, 1958; Ph.D., 1964.
- Richard V. Monopoli, *Professor of Electrical Engineering*, B.S., U.S. Naval Academy, 1952; M.S., Brown, 1960; Ph.D., Connecticut, 1965.
- William A. Nash, *Professor of Civil Engineering*, B.S.C.E., Illinois Institute of Technology, 1944; M.S., 1946; Ph.D., University of Michigan, 1949.
- Elmer C. Osgood, *Professor of Civil Engineering*, B.S.C.E., Rensselaer Polytechnic Institute, 1928; D.Eng., 1931.
- John E. Ritter, *Associate Professor of Materials Engineering*, B.S., Massachusetts Institute of Technology, 1961; M.S., 1962; Ph.D., Cornell, 1966.
- G. Albert Russell, *Assistant Professor of Mechanical and Aero-Space Engineering*, B.S., Massachusetts Institute of Technology, 1958; M.S., Arizona State, 1961; Ph.D., Connecticut, 1967.
- G. Dale Sheckels, *Professor of Electrical Engineering*, B.S., University of Washington, 1938; M.S., Massachusetts Institute of Technology, 1940; Ph.D., Iowa State, 1955.
- Fred D. Stockton, *Associate Professor of Civil Engineering*, B.S.C.E., Alabama, 1942; M.S., Brown, 1949; Ph.D., 1953.
- Ian B. Thomas, *Assistant Professor of Electrical Engineering*, B.E. (Electrical), University of Queensland, 1958; B.Sc. (Physics), 1959; M.S., University of Illinois, 1961; Ph.D., 1966.
- John W. Zahradnik, *Professor of Biological Process Engineering, Principal Scientist*, University of Massachusetts Aquacultural Engineering Lab., B.S., Pennsylvania State, 1950; M.S., Iowa State, 1951; Ph.D., Massachusetts Institute of Technology, 1965.

Ocean engineering is that activity which combines knowledge of the ocean with engineering skill to utilize the oceans, their contents or boundaries, for the achievement of human objectives. Research in ocean engineering at the University of Massachusetts was initiated in 1967 with the award of a Project THEMIS (Department of Defense) contract totaling \$720,000 for four years.

The Ocean Engineering Program is administered as a degree-granting subdivision of the Civil Engineering Department; however, the administrative mechanism provided preserves the interdisciplinary nature of ocean engineering as an objective of academic pursuit. Present programs lead to the Master of Science in Ocean Engineering and Doctor of Philosophy degrees.

Programs leading to the degree of Master of Science in Ocean Engineering are designed to promote understanding of the ocean environment while developing greater competence in a field of engineering which is applicable to ocean-oriented technical problems. The holder of this degree will have attained a general knowledge of ocean technology as it pertains to engineering endeavors. In addition to this breadth of knowledge he will have gained sufficient depth in his chosen professional specialty to allow its application to ocean problems with confidence.

Doctoral study programs in ocean engineering have been designed to prepare

individuals for high-level professional careers in academic, governmental, or industrial situations. Substantially greater competence in ocean technology will be required of doctoral candidates but professional breadth has not been sacrificed to attain this goal. Although the research leading to the doctoral dissertation assumes a predominant role in the study program, it is emphasized that the problem-oriented character of professional engineering be preserved by the appropriate selection of the research topic. Upon completion of an approved course of study, award of the doctoral degree indicates that the candidate has demonstrated excellence in a field of engineering which has significant relevance to ocean technology and that he has acquired sufficient knowledge of oceanic processes to employ his speciality with due regard for the ocean environment.

To aid the definition of requirements of the degree programs described above, the formal courses available to students of ocean engineering are classified according to whether they are "core" or "specialty" courses. The course requirements for each degree are prescribed in terms of a "core curriculum" and one or more groups of courses which combine to form areas of specialized knowledge, or "specialties" in an ocean engineering study program.

The core curriculum is a group of basic courses that will normally be required of every degree candidate in ocean engineering. The purpose of the core curriculum is to establish a base of knowledge which permits and encourages further study and eventual specialization.

At least ten "specialties" are identified in the array of available ocean engineering courses:

1. Acoustics
2. Applied Physical Oceanography
3. Energy Storage and Conversion
4. Marine Corrosion and Materials Engineering
5. Marine Propulsion

6. Navigation, Control, and Information Processing
7. Ocean Structures and Marine Foundations
8. Ocean Systems Engineering and Design
9. Operations Research for the Ocean Environment
10. Systems for Aquacultural Engineering

Each specialty represents an area of specialized knowledge which is supported by courses from one or more of the traditional disciplines of engineering and science. Proficiency in at least one of the available specialties is required of candidates for the Master of Science in Ocean Engineering. Doctoral candidates are required to pursue at least one specialty in considerable depth while proficiency in a second area will be encouraged. The means for demonstrating these proficiencies are discussed as specific requirements for each of the degrees.

Requirements for the Master of Science in Ocean Engineering

All university requirements pertaining to the degree must be fulfilled. The following minimum requirements and information refer specifically to the degree of Master of Science in Ocean Engineering.

1. It is assumed that a student seeking this degree will have a baccalaureate in either engineering or science, with enough mathematics, physics, and chemistry to permit undertaking engineering graduate studies. As a guideline to determining the adequacy of undergraduate preparation, the potential degree candidate should be able to demonstrate proficiency in the following subject areas:
 - (a) general chemistry and physics
 - (b) calculus and elementary differential equations
 - (c) engineering mechanics (fluid and solid)
 - (d) basic thermodynamics and heat transfer
 - (e) basic electrical circuits

2. Three core courses must be included in the program of every candidate. Two core courses are specified:

- (a) MS 525. Introductory Oceanography.
- (b) OE 510 (CE 559). Engineering Oceanography.

The third core course is to be chosen from the following:

- (c) OE 530 (CE 580). Materials in the Ocean Environment.
- (d) OE 550 (EE 587). Marine Instrumentation.
- (e) OE 570 (CE 590). Engineering Design of Ocean System Payload Devices.
- (f) OE 571 (CE 591). Deep Ocean Systems Engineering and Design I.

3. Every candidate must complete two or more courses in a single specialty of the ocean engineering curriculum. Courses taken as core requirements may not be used to fulfill this obligation.
4. All candidates for this degree will complete a thesis which will account for at least six credits in the 30-credit program.
5. Nine of the 30 credits required for this degree may be satisfied by a selection of electives which are approved by the candidate's adviser. Electives are not restricted to engineering courses but they must form a cohesive program with a clearly defined objective. No more than three credits of Special Problems may be included in the program.
6. If coursework is pursued on a full-time basis it should be possible to complete the requirements for this degree in one calendar year. However, if financial aid is obtained through an assistantship, or if undergraduate deficiencies must be removed by additional coursework, a somewhat longer time will be necessary for completion of all requirements.

Requirements for the Degree of Doctor of Philosophy

All university requirements pertaining to

this degree must be fulfilled. The following minimum requirements and information refer specifically to doctoral studies undertaken within the Ocean Engineering Program.

1. It is assumed that a student seeking this degree will have a baccalaureate in either engineering or science, with enough mathematics, physics, and chemistry to permit undertaking engineering graduate studies. As a guideline to determining the adequacy of undergraduate preparation, the potential degree candidate should be able to demonstrate proficiency in the following subject areas:
 - (a) general chemistry and physics
 - (b) calculus and elementary differential equations
 - (c) engineering mechanics (fluid and solid)
 - (d) basic thermodynamics and heat transfer
 - (e) basic electrical circuits
2. A core curriculum must be included in the study program of every doctoral candidate. Any or all of the core courses may have been utilized to satisfy requirements for the Master of Science in Ocean Engineering; however, that degree is not a prerequisite for doctoral studies in Ocean Engineering. The core curriculum is composed of six courses:
 - (a) MS 525. Introductory Oceanography.
 - (b) OE 510 (CE 559). Engineering Oceanography.
 - (c) OE 530 (CE 580). Materials in the Ocean Environment.
 - (d) OE 550 (EE 587). Marine Instrumentation.
 - (e) OE 570 (CE 590). Engineering Design of Ocean System Payload Devices.
 - (f) OE 571 (CE 591). Deep Ocean Systems Engineering and Design I.
3. No specific course requirements other than the core curriculum are prescribed for the doctoral program. It is the obligation of the candidate, un-

der the direction of his adviser, to propose a unified program of study and research which will lead to the achievement of his academic and professional objectives. The proposed program should reflect the philosophy of doctoral studies already set forth in this section; that is, a professional engineering viewpoint of ocean technology must be evident. The program must receive the unanimous approval of the candidate's Guidance Committee.

4. All candidates will be required to obtain a first-hand familiarity with the oceanic environment. Normally, this experience will be obtained through responsible participation in a prolonged oceanographic cruise. Faculty of the Ocean Engineering Program will provide assistance in the arrangement of appropriate cruise experience for the candidates.
5. If coursework and dissertation research are pursued on a full time basis, it should be possible to complete the requirements for this degree in two calendar years following the award of a Master of Science in Ocean Engineering. If financial aid is obtained through an assistantship, a somewhat longer time will be necessary for completion of all requirements. Prospective candidates will be urged to plan on the more realistic estimate of approximately three calendar years following the M.S. to complete the degree requirements.
6. Preparation of dissertations *in absentia* will not generally be approved.

Course Offerings in Ocean Engineering

Study programs in Ocean Engineering typically consist of courses from two categories: (a) courses which are specifically oriented to ocean problems and thus carry the Ocean Engineering designator of an OE number, and (b) courses which enhance the preparation for any of the Ocean Engineering specialties but are not necessarily oriented to ocean problems. The proper selection of courses from both of these categories can

ensure acquisition by the student of a broad ocean-associated knowledge combined with an acceptable level of professional competence.

The Ocean Engineering courses are listed below and grouped according to the engineering departments which offer them.

700 SERIES COURSES ARE OPEN TO GRADUATE STUDENTS ONLY. 500 AND 600 SERIES COURSES ARE OPEN TO GRADUATE STUDENTS AND UPPER LEVEL UNDERGRADUATES WITH ADVISER'S APPROVAL AND INSTRUCTOR'S CONSENT.

Civil Engineering Department

- CE 559 (OE 510). Engineering Oceanography.
- CE 580 (OE 530). Materials in the Ocean Environment.
- CE 590 (OE 570). Engineering Design of Ocean System Payload Devices.
- CE 591 (OE 571). Deep Ocean Systems Engineering and Design I.
- CE 724 (OE 761). Submarine Soil Mechanics and Foundation Engineering.
- CE 737 (OE 764). Coastal Structures.
- CE 738 (OE 765). Analysis and Design of Offshore Structures.
- CE 751 (OE 711). Fluid Mechanics of the Oceans.
- CE 752 (OE 712). Ocean Wave Theory.
- CE 764 (OE 777). Coastal Engineering.
- CE 781 (OE 731). Materials for Submarine Structures.
- CE 783 (OE 763). Structural Mechanics of Deep Submersible Vehicles.
- CE 792 (OE 772). Deep Ocean Systems Engineering and Design II.
- CE 793 (OE 773). Public Policy and Use of the Seas.

CE 796 (OE 776). Ocean Engineering
Field Laboratory II.

Electrical Engineering Department

EE 587 (OE 550). Marine Instrumenta-
tion.

EE 741 (OE 721). Energy Storage and
Conversion.

EE 742 (OE 701). Underwater Acoustics

EE 743 (OE 751). Navigation.

Industrial Engineering Department

IE 758 (OE 781). Design of Closely
Confined Manned Op-
erations Stations.

*Mechanical and Aero-Space Engineering
Department*

MAE 610 (OE 791). Aquacultural Engi-
neering.

The graduate level courses which support
the objectives of the Ocean Engineering
Program are listed below and grouped ac-
cording to the departments which offer
them.

Chemical Engineering Department

CHE 663. Survey of Nuclear Engi-
neering I.

CHE 664. Survey of Nuclear Engi-
neering II.

CHE 701. Chemical Engineering Thermo-
dynamics I.

CHE 702. Chemical Engineering Thermo-
dynamics II.

CHE 705. Chemical Reactor Design.

CHE 781. Nuclear Chemical Engineering

Civil Engineering Department

CE 552. Soil Testing.

CE 556. Introduction to Hydrodynamics.

CE 561. Open Channel Flow.

CE 720 Theoretical Soil Mechanics.

CE 794 (OE 774). Fundamentals of
Naval Architecture.

CE 795 (OE 775). Ocean Engineering
Field Laboratory I.

CE 721. Applied Soil Mechanics.

CE 723. Shear Strength of Soils.

CE 733. Advanced Topics in Concrete.

CE 734. Numerical Methods in Structural
Mechanics.

CE 735. Matrix Analysis of Structures.

CE 741. Structural Dynamics.

CE 742. Experimental Stress Analysis.

CE 743. Elasticity.

CE 744. Theory of Plates and Shells.

CE 745. Structural Stability.

CE 757. Advanced Fluid Mechanics.

Electrical Engineering Department

EE 594. Microwave Engineering.

EE 601. Random Signal Theory.

EE 705. Analysis of Linear Systems.

EE 706. Electromagnetic Field Theory.

EE 707. Advanced Microwave Engi-
neering.

EE 709. Advanced Analysis.

EE 733. Digital Control Systems.

EE 734. Optimum Control Systems.

EE 735. Adaptive Control.

EE 745. Information Theory.

EE 746. Statistical Communication Theory

EE 747. Transistor Circuits.

EE 748. Network Synthesis.

Industrial Engineering Department

IE 560. Safety Engineering.

IE 571. Basic Probability for Engineers.

IE 572. Principles of Engineering Statistics.

IE 579. Industrial Engineering Problems.

IE 720. Advanced Topics in Operations
Research.

IE 722. Advanced Topics in Operations
Research.

IE 755. Quality Control and Reliability Engineering.

IE 756. Advanced Topics in Data Processing.

IE 757. Human Factors Design Engineering.

IE 763. Information Science and Technology.

Mechanical and Aerospace Engineering Department

MAE 548. Aerospace Structures.

MAE 555. Aquacultural Engineering Systems.

MAE 601. Advanced Engineering Analysis and Design I.

MAE 602. Advanced Engineering Analysis and Design II.

MAE 608. Physical Metallurgy Principles.

MAE 706. Advanced Heat Transfer II.

MAE 707. Viscous Fluids I.

MAE 709. Mechanical Properties of Materials.

MAE 713. Advanced Propulsion Systems.

MAE 714. Principles of Turbomachinery.

MAE 741. Shock and Vibration.

MAE 743. Stability of Structures.

MAE 746. Advanced Vibrations.

MAE 748. Theory of Shells.

Botany Department

BOTANY 541. Phycology.

BOTANY 741. Advanced Phycology.

Geology Department

GEOL 752. Geological Oceanography.

GEOL 756. Coastal Processes.

Marine Sciences Program

MS 501. Biological Oceanography.

MS 525. Introductory Oceanography.

MS 550. Microbial Ecology of the Marine Environment.

Wildlife and Fisheries Biology

WILDLF 572. Introduction to Marine Fisheries.

WILDLF 756. Fisheries Biometrics

WILDLF 757. Advanced Fisheries Management.

Zoology Department

ZOOL 571. Invertebrate Zoology.

ZOOL 602. Ichthyology.

ZOOL 635. Limnology.

ZOOL 637. Population and Community Ecology.

Ocean Engineering courses are grouped below according to the established Program specialty areas.

Acoustics

OE 701 (EE 742). UNDERWATER ACOUSTICS.

A summary of the principles, effects, and phenomena of underwater sound and its application to practical problems.

Three class hours.

Prerequisite, EE 306. *Credit*, 3. Mr. Hill, Mr. Russell, and/or Mr. Thomas.

Applied Physical Oceanography

OE 510 (CE 559). ENGINEERING OCEANOGRAPHY.

Fluid mechanics problems of ocean and coastal engineering including currents, tides, surface waves, tsunami and seiche phenomena, and ocean circulation.

Three class hours.

Prerequisites, CE 257 and Introductory Oceanography (MS 525).

Credit, 3. Mr. Carver and/or Mr. Colonell.

OE 711 (CE 751). FLUID MECHANICS OF THE OCEANS.

An examination of oceanic physics with emphasis on those aspects which are of major engineering importance. Introduction of classical hydrodynamics and development of the Navier-Stokes equations for application to problems of oceanic scale.

Three class hours.

Prerequisites, OE 510 and CE 556.

Credit, 3. Mr. Colonell.

OE 712 (CE 752). OCEAN WAVE THEORY.

Classical theory of water waves, generation and propagation of waves at sea, observation and recording of waves, wave spectra and sea forecasting, tsunami propagation and detection.

Three class hours.

Prerequisites, OE 510 and CE 556.

Credit, 3. Mr. Colonell.

Energy Storage and Conversion

OE 721 (EE 741). ENERGY STORAGE AND CONVERSION.

Methods of energy generation, conversion, and control, with emphasis on the utilization for deep sea submersible vehicles.

Three class hours.

Credit, 3. Mr. Monopoli and/or Mr. Schekels.

Marine Corrosion and Materials Engineering

OE 530 (CE 580). MATERIALS IN THE OCEAN ENVIRONMENT.

The response of structural materials to the ocean environment, theory of corrosion; abrasion; erosion and biological attack.

Three class hours.

Prerequisites, Introductory Oceanography (MS 525).

Credit, 3. Mr. Lindsey or Mr. Harris.

OE 731 (CE 781). MATERIALS FOR SUBMARINE STRUCTURES.

The response of materials subjected to high compressive loadings in the sea water medi-

um; theory of deformation and fracture under high compressive stress; brittle-ductile transition in materials, stress corrosion, corrosion fatigue.

Three class hours.

Prerequisite, OE 530.

Credit, 3. Mr. Harris.

Navigation, Control, and Information Processing

OE 550 (EE 587). MARINE INSTRUMENTATION.

A survey of the oceanographic parameters of interest to ocean engineers, followed by the theory of measuring these parameters. Typical examples of existing measuring equipment.

Three class hours.

Credit, 3. Mr. Hutchinson.

OE 751 (EE 743). NAVIGATION.

A survey of the principles of navigation with emphasis on the information processing involved and error analyses.

Three class hours.

Credit, 3. Mr. Hutchinson.

OE 752 (EE 736). DYNAMICS AND CONTROL OF MARINE VEHICLES.

The equations of motion for a marine vehicle; the stability and dynamics for control.

Three class hours.

Credit, 3. Mr. Hutchinson and/or Mr. Monopoli.

Ocean Structures and Marine Foundations

OE 761 (CE 724). SUBMARINE SOIL MECHANICS AND ENGINEERING.

Exploration of marine sediments, the assessment of the geotechnical properties and methods for altering the properties of marine sediments; submarine slope stability; foundation design factors for structures on and in marine sediments.

Three class hours.

Prerequisite, CE 220.

Credit, 3. Mr. Bemben.

OE 763 (CE 783). STRUCTURAL
MECHANICS OF
DEEP SUBMERS-
IBLE VEHICLES.

Elastic and inelastic action of pressure hull structures for deep submersible vehicles. Presentation of design criteria for stiffened shells and plating common to such systems. Three class hours.

Prerequisites, MAE 246 or CE 141 and CE 240. *Credit, 3.* Mr. Nash, Mr. Dzialo.

OE 764 (CE 737). COASTAL
STRUCTURES.

Factors influencing the loading, performance, and durability of coastal structures; resistance of construction materials to deterioration; design of waterfront and off-shore structures.

Three class hours.

Prerequisites, CE 232, 331, and 333.

Credit, 3. Mr. Osgood.

OE 765 (CE 738). ANALYSIS AND
DESIGN OF OFF-
SHORE STRUC-
TURES.

Structural design of offshore structures such as buoys, towers, bridges, artificial islands, tunnels, and other special structures. Functional design considerations and methods of construction.

Three class hours.

Prerequisites, OE 510, CE 534, and CE 540.

Credit, 3. Mr. Miller.

Ocean Systems Design and Engineering

OE 570 (CE 590). ENGINEERING
DESIGN OF
OCEAN SYSTEM
PAYLOAD DE-
VICES.

Techniques for augmentation of man's ability to measure, test, and synthesize the ocean environment through the development of tethered, towed, or stationary equipment. Topics include underwater photography, lighting, manipulative and prosthetic devices, data gathering equipment, and underwater equipment design.

Three class hours.

Prerequisite, Introductory, Oceanography (MS 525).

Credit, 3. Mr. Heronemus, Mr. Adams.

OE 571 (CE 591). DEEP OCEAN
SYSTEMS ENGI-
NEERING AND
DESIGN I.

Systems engineering applied to analysis and synthesis of systems capable of doing useful work in the deep oceans, with emphasis on design of deep submergence vessels.

Three class hours, one 3-hour laboratory period.

Credit, 4. Mr. Heronemus.

OE 772 (CE 792). DEEP OCEAN
SYSTEMS ENGI-
NEERING DE-
SIGN II.

A continuation of systems engineering applied to deep ocean systems. The class, organized and operating as a multidisciplinary engineering team, execute engineering and design for one or more complete systems. Three class hours, one 3-hour laboratory period.

Prerequisite, OE 571.

Credit, 4. Mr. Heronemus.

OE 773 (CE 793). PUBLIC POLICY
AND THE USE
OF THE SEAS.

Policies of the United States and other nations toward possession and use of the seas. Laws and agreements relating to jurisdiction in the marine frontier. Use of continental shelf, world-wide navigation systems, exploitation of natural resources, pollution of the oceans.

One class hour.

Credit, 1. Mr. Heronemus, Staff.

OE 774 (CE 794). FUNDAMENTALS
OF NAVAL
ARCHITECTURE.

Statics and dynamics of surface ships and submarines, hull shape, form and delineation, resistance, speed, power, propellers, longitudinal strength, transverse strength, steering and turning.

Three class hours, one 3-hour laboratory period.

Credit, 4. Mr. Heronemus, Mr. Adams.

OE 772 (CE 792). DEEP OCEAN ENGINEERING FIELD LABORATORY I.

Introduction to oceanographic measurements and field operations especially waves, currents, sea water characteristics, materials durability, and marine instrumentation techniques. Preliminary design of field engineering project.

Prerequisite, completion of OE core curriculum. *Credit, 3 (summer only.)* OE Staff.

OE 776 (CE 796). OCEAN ENGINEERING FIELD LABORATORY II.

Design, fabrication, installation, and evaluation involved in ocean engineering. Emphasis on development of practical engineering approaches to problems in the ocean environment.

Prerequisite, OE 775.

Credit, 3 (summer only.) OE Staff.

OE 777 (CE 764). COASTAL ENGINEERING.

Role of the environment in the planning, design, and operation of engineering works in coastal waters. Physical and biological aspects of pollution in estuaries and coastal inlets.

Prerequisites, CE 556 and 559 or permission of instructor. *Credit, 3.* Mr. Colonell.

OE 781 (IE 758). DESIGN OF CLOSELY CONFINED MANNED OPERATIONS STATIONS.

Introductory anatomy and physiology. Respiration: effects of various air composition and pressures on efficiency. Console design, anthropometry, work place layout, design of controls, psychological and physiological effects of work in confined space. System design — allocation of function.

Three class hours, one 2-hour laboratory period.

Prerequisite, IE 757 or permission of instructor. *Credit, 4.* IE Staff.

Systems for Aquacultural Engineering

OE 591 (MAE 555, AGE 611) AQUACULTURAL ENGINEERING SYSTEMS

Engineering systems and biological systems approaches, process analysis, and aquacultural engineering unit operations. Case study of biological data used in the derivation of useful engineering system design relationships. Rate theory and similitude in the scale-up of aquacultural processes. Field trip to inspect an aquacultural project in operation. Three class hours.

Credit, 3. Mr. Zahradnik.

Philosophy

GRADUATE FACULTY

Vere C. Chappell, *Head of the Department and Professor of Philosophy*, B.A., Yale University, 1951; M.A., 1953; Ph.D., 1958.

Robert Ackermann, *Professor of Philosophy*, A.B., Capital University, 1954; M.A., Ohio University, 1957; Ph.D., Michigan State University, 1960.

Bruce Aune, *Professor of Philosophy*, A.B., University of Minnesota, 1955; M.A., 1957; Ph.D., 1960.

John A. Brentlinger, *Assistant Professor of Philosophy*, A.B., University of Chicago, 1958; M.A., Yale, 1960; Ph.D., 1962.

David M. Clay, *Assistant Professor of Philosophy*, B.A., Swarthmore College, 1957; M.A., Princeton University, 1959.

Leonard H. Ehrlich, *Associate Professor of Philosophy*, B.S., Roosevelt University, 1947; M.A., Yale University, 1958; Ph.D., 1960.

Fred Feldman, *Assistant Professor of Philosophy*, B.A., Bard College, 1963; M.A., Harpur College, 1965; Ph.D., Brown University, 1968.

Lawrence Foster, *Assistant Professor of Philosophy*, A.B., University of Pennsylvania, 1961; Ph.D., University of Pennsylvania, 1966.

Edmund L. Gettier, III, *Associate Professor of Philosophy*, B.A., Johns Hopkins University, 1949; Ph.D., Cornell, 1961.

Herbert Heidelberger, *Associate Professor of Philosophy*, B.A., New York University, 1955; M.A., Princeton, 1960; Ph.D., 1962.

Gareth Matthews, *Professor of Philosophy*, A.B., Franklin College, 1951; A.M., Harvard, 1952; Ph.D., 1960.

Felix Oppenheim, *Professor of Government*, LL.D., Brussels University, 1938; Ph.D., Princeton, 1942.

John Robison, *Associate Professor of Philosophy*, B.A., University of Georgia, 1957; M.A., Emory University, 1958; Ph.D., University of Pennsylvania, 1962.

Clarence Shute, *Professor of Philosophy*, A.B., Asbury College, 1923; A.M., Columbia University, 1925; Ph.D., 1941.

Robert C. Sleight, Jr., *Professor of Philosophy*, B.A., Dartmouth College, 1954; M.A., Brown, 1957; Ph.D., 1963.

ASSOCIATED FIVE-COLLEGE GRADUATE FACULTY

Roger W. Holmes, *Mary Lyon Professor of Philosophy*, (Mount Holyoke College), B.S., Harvard, 1926; Ed.M., 1927; M.A., 1931; Ph.D., 1933.

William E. Kennick, *Professor of Philosophy*, (Amherst College), A.B., Oberlin College, 1945; Ph.D., Cornell, 1952.

Murray J. Kiteley, *Assistant Professor of Philosophy*, (Smith College), B.A., University of Minnesota, 1950; M.A., 1958; Ph.D., 1959.

Alice A. Lazerowitz, *Professor of Philosophy*, (Smith College), B.A., Milliken University, 1928; M.A., Wisconsin, 1929; Ph.D., 1932; Ph.D., Cambridge University, England, 1938; LL.D., Milliken University, 1958.

Morris Lazerowitz, *Professor of Philosophy*, (Smith College), A.B., University of Michigan, 1933; Ph.D., 1936.

F. Bruce Morgan, *Professor of Religion*, (Amherst College), A.B., Marysville

College, 1939; B.D., Princeton Theological Seminary, 1942; Th.D., 1958.

Richard S. Robin, *Associate Professor of Philosophy*, (Mount Holyoke College), A.B., Harvard, 1948; Ph.D., 1958.

George V. Tovey, *Associate Professor of Philosophy*, (Mount Holyoke College), A.B., Lafayette, 1942; Ph.D., Columbia, 1950.

The Philosophy Department offers a comprehensive program covering the major areas of philosophic study, leading to the M.A. and Ph.D. degrees. A wide variety of approaches and fields are represented by the faculty. The program is designed to prepare students for college and university teaching in philosophy through historical and systematic studies in which the development of independent, critical thought is strongly emphasized. The small graduate enrollment of about thirty-five students makes it possible to sustain a lively seminar atmosphere.

General information on admission and degree requirements may be found in the front of this Catalog Pages 11 through 43. Application forms may be obtained by writing to the Graduate School, University of Massachusetts, Amherst, Massachusetts 01002. In order to ensure the possibility of action by the end of the academic year, applications and all supporting papers must be received by May 1. Applicants for financial aid should complete their applications by the dates annually announced by the Graduate Office.

THE COOPERATIVE PH.D. PROGRAM

The Ph.D. degree in philosophy is offered by the University in cooperation with the philosophy departments of Mount Holyoke and Smith Colleges. Residence may be at any one of the three institutions. When a student has been awarded a degree under this program, the fact that it is a cooperative degree and the college of residence are noted on the diploma, permanent record, and transcripts. Students may apply to any of the three institutions, though applications are

passed upon jointly, and the degree is awarded by the University Board of Trustees in the name of the participating institutions.

Language Examinations. The two language examinations required for the Ph.D. degree ordinarily are to be taken in French and German, but at the discretion of the department, another language, normally Greek or Latin, may be substituted for one of these. Intermediate level reading knowledge of the two languages is required.

Preliminary Examination. This examination, which is both written and oral, is comprehensive in character, and is not restricted to the content of graduate courses. Adequate preparation for it usually requires two years of graduate study after undergraduate training in philosophy of high quality.

The written part consists of written papers, four hours in length, in (a) the history of philosophy; (b) logic and philosophy of science; (c) value theory; front of this Catalog (Pages 00 through (d) metaphysics and theory of knowledge. The oral part (not to exceed two hours) will be on a field sufficiently narrow in scope to allow the student to display competence in greater depth than is possible in the written part. The choice of field is to be approved by the department.

Master of Arts Degree. Students enrolled in the cooperative Ph.D. program are awarded the Master of Arts degree upon successful completion of the preliminary examination.

The Dissertation. After completion of the residence and language requirements, and upon passing the Preliminary Examination, the student is admitted to candidacy for the Ph.D. degree in philosophy. In order to complete the requirements for the degree the candidate will write a dissertation and successfully defend it in a final oral examination.

THE MASTER OF ARTS PROGRAM

Requirements. Thirty graduate credits are required for the degree of Master of Arts

in Philosophy. Upon approval of the Department Graduate Committee, up to six graduate credits from courses in other departments may be applied toward the degree. If a thesis is offered, 12 credits must be earned in the Department's 700-900 series courses. Demonstrated reading proficiency in one foreign language, normally French or German, is required.

Options. During the second semester of full-time graduate study (or its equivalent), each student will elect, subject to the approval of the Department Graduate Committee, one of the Options A, B, or C.

OPTION A. After completion of 24 graduate credits, at least 12 of which must be from the 700-900 series in Philosophy, an area of concentration will be chosen. Then, in consultation with an adviser, those electing this alternative will plan a program of study in the chosen area. While this course of study may be of greater extent, it will normally be composed of six credits in philosophy courses in the 700-900 series. Upon completion of this course of study the student will take a written examination in his chosen field, to be followed by an oral examination as required by the Graduate School.

OPTION B. After completion of 24 graduate credits, at least 12 of which are from the 700-900 series in philosophy, those electing this alternative will, subject to the approval of the Department Graduate Committee, choose a thesis topic. The thesis will be written under the direction of a thesis committee, and successful completion of the thesis will be counted as six graduate credits in course 800. Upon completion of the thesis, an oral examination, not limited to the thesis topic, will be taken.

OPTION C. Upon completion of thirty graduate credits, at least twelve of which are from the 700-900 series in Philosophy, those electing this alternative will choose two examinations from the following four: (1) history of philosophy, (2) logic and philosophy of science, (3) metaphysics and epistemology, and

(4) value theory. The two written examinations will be followed by an oral examination which, while it will not be restricted to matters related to the subjects of the written examinations, will be based largely upon the student's answers to the questions on the written examination.

Students are advised to request from the departmental office prior to preregistration a list of scheduled graduate courses.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

Each course numbered above 700 is conducted as a seminar.

700. RESEARCH AND READING IN PHILOSOPHY.

Independent graduate research on specific topics in philosophy under the supervision of a faculty member.

Prerequisite, permission of department.

Credit, 2-6. Maximum credit, 6.

702. SEMINAR: TOPICS IN LOGIC.

Selected topics in formal logic. Particularly, the course will concentrate on such areas as leontic logic, epistemic logic, the logic of imperatives, many valued logics, modal logics, and erotetic logic.

Prerequisite, permission of instructor.

Credit, 3.

705. PROSEMINAR.

Classical works in analytical philosophy.

Prerequisite, permission of instructor.

Credit, 3.

710, 711. SELECTED PHILOSOPHERS.

Each semester a leading philosopher will be chosen for intensive reading.

Prerequisite, permission of instructor.

Credit, 3.

715. PLATO.

Examination of Plato's metaphysical and epistemological theories with emphasis upon the middle and later dialogues.

Prerequisite, permission of instructor.

Credit, 3.

720. KANT.

The *Critique of Pure Reason* will be read in its relation to Kant's philosophy as a whole.

Prerequisite, permission of instructor.

Credit, 3.

725. MAJOR WORKS IN EXISTENTIAL PHILOSOPHY.

A critical study of major philosophical writings by one of the following: Kierkegaard, Heidegger, Jaspers.

Credit, 3.

745. ETHICAL THEORY.

Analysis of selected problems of normative and meta-ethics involved in contemporary development of ethical theory.

Prerequisite, permission of instructor.

Credit, 3.

750. PHILOSOPHY OF EDUCATION.

An evaluation of various educational theories and practices on the different levels viewed in the light of historical perspective and contemporary thought.

Prerequisite, permission of instructor.

Credit, 3.

751. PHILOSOPHY OF RELIGION.

A critical study of contemporary reformulations in philosophy of religion with emphasis on the analysis of the language of religious beliefs.

Prerequisite, permission of instructor.

Credit, 3.

755. PHILOSOPHY OF LANGUAGE.

Inquiry into the nature of language, meaning, reference, communication and translation. Topics include the later Wittgenstein, Quine's contextualism, the Whorf-Sapir, hypothesis, problems in psycholinguistics.

Prerequisite, permission of instructor.

Credit, 3.

756. CONFIRMATION THEORY.

Explanation and prediction, verifiability, status of theoretical terms, contrafactual conditions; reduction, confirmation.

Prerequisite, permission of instructor.

Credit, 3.

760. METAPHYSICS.

The leading issues in contemporary debate on the nature and limits of metaphysical theory; examination of metaphysical concepts in relation to their use and treatment by other disciplines.

Prerequisite, permission of instructor.

Credit, 3.

761. PHILOSOPHY OF MIND.

The logical analysis of mentalistic concepts, the distinction between sensation and thought, the nature of intentionality, the explanation of behavior by references to reasons, and the relation between the mental and the physical.

Prerequisite, permission of instructor.

Credit, 3.

765. THEORY OF KNOWLEDGE.

Perception, subject-object relation, origins of knowledge, concept formation and language, the analytic-synthetic distinction, limits of empiricism and rationalism, relation of epistemology to metaphysics.

Prerequisite, permission of instructor.

Credit, 3.

780, 781. PROBLEMS IN THE HISTORY OF IDEAS.

Inquiry into a distinct major philosophical problem or group of related philosophical problems.

Prerequisite, permission of instructor.

Credit, 3.

790, 791. SEMINAR.

Conferences and reports on special studies in philosophy.

Credit, 1-3.

800. MASTER'S THESIS. *Credit, 6-10.*

900. DOCTORAL DISSERTATION.

Credit, 30.

COURSES OPEN TO BOTH GRADUATE AND UNDER- GRADUATE STUDENTS

(For either major or minor credit)

Prerequisites: The prerequisites listed are those normally required of undergraduate students. They may be waived by the instructor for graduate students with adequate preparation.

501. PLATO AND ARISTOTLE.

Major works of Plato and Aristotle in ethics, logic, and metaphysics, read for the systematic character of their thought and its contemporary relevance.

Credit, 3.

502. PHILOSOPHY IN THE MIDDLE AGES.

Writings of major philosophers of the period, including Augustine, Aquinas, Duns Scotus, and Ockham; the historical setting and their relevance to modern thought.

Credit, 3.

503. EUROPEAN PHILOSOPHY FROM MONTAIGNE TO ROUSSEAU.

Representative philosophical texts of the period, with concentration on authors of major historical influence such as Descartes, Spinoza, Leibniz, Pascal.

Credit, 3.

504. BRITISH PHILOSOPHY FROM BACON TO HUME.

Representative philosophical texts, with emphasis on Locke, Berkeley, and Hume, and their historical influence, especially on contemporary empiricism.

Credit, 3.

505. GERMAN PHILOSOPHY FROM THE ENLIGHTENMENT TO 1914.

Readings of original texts. Emphasis on Kant and the Nineteenth Century.

Prerequisite, permission of instructor.

Credit, 3.

518. AMERICAN PHILOSOPHY.

Examination by means of a study of selected original texts by the outstanding American philosophers, of their contribution to Western thought and American civilization.

Credit, 3.

525. INDIAN PHILOSOPHIES.

Theories of reality, of knowledge, of art, and of human destiny in the leading schools of Indian Asia; traditional and contemporary political theory.

Credit, 3.

526. EAST ASIAN PHILOSOPHIES.

Theories of human nature, society, and the state of philosophies of Chinese and Japanese origin; the modification of Buddhism under the influence of Chinese thought.

Credit, 3.

530. PHILOSOPHY OF SCIENCE.

A critical analysis of the structure of scientific method and the language of science, the respective role of induction and deduction in science, and the status of theoretical terms.

Credit, 3.

541. PHILOSOPHY OF RELIGION.

Readings in contrasting religious philosophies followed by analysis of concepts involved in understanding religion as coherently related to the other aspects of experience.

Credit, 3.

543. AESTHETICS.

Leading theories of the nature of art, the analysis of aesthetic experience, the distinctive function of art in culture and personality, and the principles of criticism.

Credit, 3.

544. EPISTEMOLOGY.

Critical examination of various accounts of the nature of knowledge, with emphasis on basic principles of epistemic logic, probability, and certainty.

Prerequisite, permission of instructor.

Credit, 3.

545. METAPHYSICS.

Critical examination of the basic problems of metaphysics. Problems discussed include the nature of necessity, the relation between universals and particulars, the concept of causality, and the relative merits of competing metaphysical views such as materialism, idealism, and dualism.

Prerequisite, permission of instructor.

Credit, 3.

561. CONTEMPORARY ANALYTIC PHILOSOPHY.

Russell, Carnap, Wisdom, the later Wittgenstein, Austin, Strawson, Quine.

Credit, 3.

564. EXISTENTIAL PHILOSOPHIES.

Examination, by means of a study of selected original texts, of the main problems peculiar to this movement as a whole and to its main exponents individually.

Credit, 3.

578. HISTORY OF ETHICS.

The ethical theories of important figures in the history of ethics will be presented chronologically to indicate historical connections

and influences. The works of the following ethical traditions are represented; ancient Greek ethics, natural law and natural right theorists, the British moral sense, sympathy, sentiment, theorists and intuitionists, Kant, utilitarianism, self-realizationism, pragmatism and contemporary intuitionists.

Prerequisite, Phil 580.

Credit, 3.

580. ETHICAL THEORY.

Some of the major problems of ethical theory with emphasis on definition, the status of ethical statements, reasoning and justification in ethics.

Credit, 3.

581. MATHEMATICAL LOGIC.

Turing machines, theory of computability, effective procedures, combinatorial systems, natural deduction, completeness of quantification theory.

Prerequisite, Phil 125 or permission of instructor.

Credit, 3.

582. THEORY OF FORMAL SYSTEMS.

Equivalence, completeness, incompleteness, decision procedure, formal syntax and semantics, recursive function theory, formal number theory, "reduction" of mathematics to logic.

Prerequisite, Phil 581 or equivalent, or permission of instructor.

Credit, 3.

590. POLITICAL PHILOSOPHY.

A systematic approach to major controversies of political science and political ethics; e.g., rationalism vs. empiricism, natural law vs. legal positivism.

Prerequisite, one semester course in philosophy.

Credit, 3.

595. CONTEMPORARY PROBLEMS.

Selected persistent philosophical problems — e.g., induction, relation of mind and body, perception, certainty of statements, knowledge of other minds, etc.

Credit, 3.

690, 691. SEMINAR.

One major philosopher, major philosophical tradition, or restricted subject in a special field of philosophical inquiry.

Prerequisites, two semester courses in philosophy and permission of instructor.

Credit, 3.

Physical Education

GRADUATE FACULTY

Warren J. McGuirk, *Dean of the School of Physical Education*, Ph.B., Boston College, 1929; Ed.M., Boston University, 1949.

Pearl Berlin, *Professor of Physical Education*, B.S., Boston University, 1946; M.S., Pennsylvania State, 1947; Ph.D., 1959.

David C. Bischoff, *Associate Dean of the School of Physical Education and Professor of Physical Education*, B.S., Pennsylvania State, 1952; M.Ed., North Carolina, 1953; Ph.D., Pennsylvania State, 1958.

Harry K. Campney, Jr., *Professor of Physical Education*, B.S., Pittsburgh 1952; M.S., Illinois, 1953; Ph.D., Iowa, 1960.

Margaret A. Coffey, *Professor of Physical Education*, B.S., DePauw University, 1943; M.A., Iowa, 1946; Ph.D., 1963.

D. W. Edington, *Assistant Professor of Physical Education*, B.S., Michigan State, 1959; M.S., Florida State, 1963; Ph.D., Michigan State, 1968.

Ellen W. Gerber, *Assistant Professor of Physical Education*, B.S., Boston University, 1957; M. Litt., Pittsburgh, 1960; Ph.D., Southern California, 1966.

E. Vickery Hubbard, *Associate Professor of Physical Education*, B.S., Wisconsin, 1932; M.A., Chicago, 1951; Ed.D., California, 1961.

Walter Kroll, *Professor of Physical Education*, B.S., Northern Illinois, 1952; M.S., Illinois, 1953; P.E.D., Indiana, 1959.

Guy M. Lewis, *Associate Professor of Physical Education*, B.S., East Carolina College, 1950; M.Ed., North Carolina, 1952; Ph.D., Maryland, 1964.

John W. Loy, Jr., *Associate Professor of Physical Education*, B.S., Lewis and Clark College, 1961; M.A., Iowa, 1963; Ph.D., Wisconsin, 1967.

Stanley Plagenhoef, *Associate Professor of Physical Education*, B.S., Michigan, 1949; M.S., 1951; Ph.D., 1962.

Benjamin Ricci, Jr., *Professor of Physical Education*, B.S., Springfield College, 1949; M.Ed., 1950; D.P.E., 1958.

Harold J. VanderZwaag, *Professor of Physical Education*, B.A., Calvin College, 1951; M.A., University of Michigan, 1952; Ph.D., 1962.

C. Lynn Vendien, *Associate Professor of Physical Education*, B.S., Eastern Michigan, 1932; M.A., Michigan, 1945; Ed.D., Stanford, 1957.

The School of Physical Education offers programs of study leading to Master of Science and Doctor of Philosophy degrees in human movement. In addition to the requirements for admission to the Graduate School, the School of Physical Education requires an applicant to present certain undergraduate courses. The undergraduate preparation needed for admission varies with the degree programs. However, in the event that any of these entrance requirements have not been satisfied, the applicant will be required to remove his deficiencies without graduate credit.

The degree requirements include 30 (thesis) or 36 (non-thesis) graduate credits for the M.S. degree and approximately 90 graduate credits for the Ph.D. degree. In both degree programs the majority of these credits are earned in courses offered within the School of Physical Education, but at least six semester hours (M.S.) or eighteen semester hours (Ph.D.) must be elected from offerings of departments outside of the School. The credits earned in the School come from both required and elective courses in both degree programs.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS.

Individual research on a topic not covered by any existing courses. Normally confined

to an extension of the content of an existing course rather than an introduction to a new area of study.

Prerequisites, permission of instructor and director of the graduate program.

Credit, 1-6. Staff.

711. INTRODUCTION TO RESEARCH IN HUMAN MOVEMENT.

The nature of research; methods of acquiring knowledge; research and social progress; general concepts concerning the scientific method.

Credit, 1. Mr. Campney.

712. DATA ANALYSIS AND INTERPRETATION IN HUMAN MOVEMENT RESEARCH.

Theory and techniques involved in the analysis and interpretation of data pertinent to research in human movement. Parametric and non-parametric inference statistics applied to data encountered in human movement research.

Prerequisite, Stat 121.

Credit, 3. Mr. Campney.

722. EXERCISE PHYSIOLOGY INSTRUMENTATION THEORY.

Instrumentation theory relative to the equipment utilized in estimating parameters in exercise physiology.

Prerequisite, Zoology 135, PE 278 and 621.

Credit, 3. Mr. Ricci.

732. BIOMECHANICS.

Physical and biological considerations applied to the teaching of motor skills.

Prerequisite, PE 141, 142 and 631.

Credit, 3. Mr. Plagenhoef.

742. MOTOR INTEGRATION PRACTICUM.

Theory and practice in laboratory analysis of gross motor functions. Topics include nerve conduction velocity, reflex latency, response and reaction time, and electromyographic analysis of local muscular fatigue as related to skilled and unskilled gross motor performance.

Prerequisites, PE 141, 142, 278, 641, Zool 135.

Credit, 3. Mr. Kroll.

763. HISTORY OF SCHOOL AND COLLEGE SPORT.

Developments in sport at educational institutions from the age of unorganized play to the present.

Prerequisites, PE 561 or PE 662. *Credit, 3.*

772. ATHLETICS: A PHILO- SOPHIC INQUIRY.

A critical analysis of those historical, sociological, and psychological factors which have influenced the concept of athletics and caused issues in programs associated with this concept.

Prerequisites, PE 564.

Credit, 3.

782. SEMINAR IN THE SOCIOLOGY OF SPORT.

An analysis of the utility of sociological paradigms, models and theories for the explanation of sport phenomena, including autotelic and agonetic game behavior.

Prerequisites, PE 565, one sociological theory course and one research methods course.

Credit, 3.

799. CONTEMPORARY PROBLEMS IN HUMAN MOVEMENT.

Seminar, review, analysis, and evaluation of contemporary problems. A broad review of literature combined with critical analysis of selected items.

Credit, 3. Staff.

800. MASTER'S THESIS.

Credit, 3-6. Staff.

813. MEASUREMENT THEORY AND HUMAN MOVEMENT RESEARCH.

The theory of the construction of evaluative instruments in human movement with emphasis on a critical examination of existing measurement devices.

Prerequisites, PE 274 and 712.

Credit, 3. Mr. Campney.

823. EXPERIMENTAL PHYSIOLOGY OF EXERCISE.

Experimental investigation of the physiological effects of exercise.

Prerequisite, PE 621. *Credit, 3. Mr. Ricci.*

824. RESPIRATORY RESPONSES
TO EXERCISE.

Human respiratory responses to exercise at sea level and in reduced or increased pressure environment.

Prerequisite, PE 621.

Credit, 3. Mr. Edington.

825. EXERCISE METABOLISM.

A study of the factors affecting human metabolism under exercise conditions.

Prerequisite, PE 621.

Credit, 3. Mr. Edington.

833. FORCES AND MOMENTS
OF FORCE IN HUMAN
MOTION.

The analysis of whole body muscle action during movement and impact.

Prerequisite, PE 732.

Credit, 3. Mr. Plagenhoef.

834. KINESTHETIC FORM.

The problem of the definition of form in movement as it relates to learning.

Credit, 3. Miss Hubbard.

843. NEUROMUSCULAR FATIGUE.

Analysis of fatigue and recovery processes in gross human motor activity.

Prerequisites, PE 621, 742, 813, and Stat 561.

Credit, 3. Mr. Kroll.

844. KINESTHESIA.

Anatomical and functional analysis of the kinesthetic phenomena in gross human motor activity.

Prerequisites, PE 641, Psych 511, and Stat 581.

Credit, 3. Mr. Kroll.

899. SEMINAR IN HUMAN
MOVEMENT.

Topics in human movement not covered in regular courses.

Credit, 1 per semester.
Maximum credit, 6. Staff.

900. DOCTORAL DISSERTATION.

Credit, 12. Staff.

COURSES OPEN TO BOTH GRADUATE
AND UNDERGRADUATE STUDENTS.

(For either major or minor credit)

561. WORLD HISTORY OF SPORT.

An examination of factors influencing the

rise of sport and the role of sport in society.

Prerequisite, PE 202.

Credit, 3. Mr. Lewis.

564. PHILOSOPHY OF SPORT.

A philosophical analysis of key concepts which influence the objectives and content of various programs in the broad realm of sport.

Prerequisite, PE 203.

Credit, 3. Mr. VanderZwaag.

565. SOCIOLOGY OF SPORT.

Sport as a social institution, including both the structure and function of sport.

Prerequisite, PE 200. *Credit, 3. Mr. Loy.*

621. PHYSIOLOGICAL BASIS OF
HUMAN PERFORMANCE.

Analysis and interpretation of cardiovascular-pulmonary adjustment, metabolic requirement, and heat regulation during exercise.

Prerequisite, PE 278.

Credit, 3. Mr. Ricci.

631. MECHANICAL ANALYSIS OF
HUMAN MOTION.

Application of the principles of mechanics to the analysis of human motion.

Prerequisites, PE 141 and 142.

Credit, 3. Mr. Plagenhoef.

641. MOTOR INTEGRATION.

Examination of the control of muscular activity by the nervous system. Topics include basic motor system reflexes, cross transfer, fatigue, kinesthetic sense, lateral dominance, and neuromuscular facilitation techniques.

Prerequisites, PE 141, 142, 278 and Zool 135.

Credit, 3. Mr. Kroll.

651. THEORY OF THERAPEUTIC
EXERCISE.

Theory of therapeutic exercise for the mentally retarded, physically handicapped, and normal.

Prerequisite, PE 259.

Credit, 3. Mr. James.

652. PHYSICAL ACTIVITY AND
MENTAL RETARDATION.

Physical activity relative to the behavior of

the mentally retarded.

Prerequisite, PE 259. *Credit*, 3. Mr. James.

662. HISTORY OF SPORT IN THE UNITED STATES.

Sport in America from earliest times to the contemporary period. Emphasis on the social, political and economic factors which affected the development of sport.

Prerequisite, PE 561. *Credit*, 3. Mr. Lewis.

663. COMPARATIVE SPORT.

A comparative analysis of sport in selected countries. Emphasis on historical, cultural, and social values affecting the status of sport.

Prerequisite, PE 561.

Credit, 3. Miss Vendien.

Physics and Astronomy

(See also ASTRONOMY)

GRADUATE FACULTY

LeRoy F. Cook, *Acting Head of the Department of Physics and Astronomy and Professor of Physics*, B.A., California at Berkeley, 1953; M.A., 1957; Ph.D., 1959.

Thomas T. Arny, *Associate Professor of Astronomy*, B.A., Haverford, 1961; Ph.D., Arizona, 1965.

John J. Brehm, *Associate Professor of Physics*, B.S., Maryland, 1956; M.S., Cornell, 1959; Ph.D., Maryland, 1963.

Frederick W. Byron, *Associate Professor of Physics*, A.B., Harvard, 1959; Ph.D., Columbia, 1963.

Edward S. Chang, *Assistant Professor of Physics*, B.A., California at Riverside, 1961; M.A., 1964; Ph.D., 1967.

Stanley Engelsberg, *Professor of Physics*, B.S., Massachusetts Institute of Technology, 1955; M.A., Harvard, 1957; Ph.D., 1961.

Norman C. Ford, *Associate Professor of Physics*, B.S., Massachusetts Institute of Technology, 1953; M.A., Syracuse, 1960; Ph.D., California at Berkeley, 1964.

Dietrich R. Freytag, *Associate Professor of Physics*, Diploma, University of Bonn, Germany, 1958; Ph.D., 1962.

Robert L. Gluckstern, *Associate Provost and Professor of Physics*, B.E.E., City College of New York, 1944; Ph.D., Massachusetts Institute of Technology, 1948.

H. Mark Goldenberg, *Associate Professor of Physics*, B.S., California Institute of Technology, 1956; M.S., Harvard, 1957; Ph.D., 1960.

Eugene Golowich, *Associate Professor of Physics*, B.S., Rensselaer Polytechnic Institute, 1961; Ph.D., Cornell, 1965.

Robert A. Guyer, *Associate Professor of Physics*, B.S., New Mexico State, 1959; Ph.D., Cornell, 1966.

Robert B. Hallock, *Assistant Professor of Physics*, B.S., Massachusetts at Amherst, 1965; M.S., Stanford, 1967; Ph.D., 1969.

Edward R. Harrison, *Professor of Astronomy*, Graduate, Institute of Physics, England, 1949; Associate, 1956; Fellow, 1963.

Stanley S. Hertzbach, *Associate Professor of Physics*, B.E.S., Johns Hopkins, 1959; Ph.D., 1965.

Allan R. Hoffman, *Assistant Professor of Physics*, B.E., Phys., Cornell, 1959; M.S., Illinois, 1961; Ph.D., Brown, 1966.

David R. Inglis, *Professor of Physics*, A.B., Amherst, 1928; D.Sc., Michigan, 1931.

William M. Irvine, *Chairman, Astronomy Program, and Professor of Astronomy*, B.S., Pomona, 1957; M.A., Harvard, 1958; Ph.D., 1961.

Phillips R. Jones, *Professor of Physics*, B.S., Massachusetts, 1951; M.S., Connecticut, 1956; Ph.D., 1959.

Joseph W. Kane, *Assistant Professor of Physics*, B.S., Wisconsin at Milwaukee, 1961; M.S., Illinois, 1962; Ph.D., 1966.

Richard R. Kofler, *Associate Professor of Physics*, B.S., Marquette University, 1958; M.S., Wisconsin, 1960; Ph.D., 1964.

Robert V. Krotkov, *Associate Professor of Physics*, B.A., Queens University, Canada, 1951; M.S., 1952; Ph.D., Princeton, 1958.

Kenneth H. Langley, *Assistant Professor of Physics*, B.S., Massachusetts Institute of Technology, 1958; Ph.D., California at Berkeley, 1966.

William J. Mullin, *Assistant Professor of Physics*, B.S., St. Louis University, 1956; Ph.D., Washington University (St. Louis), 1965.

Claude M. Penchina, *Associate Professor of Physics*, B.E., Cooper Union, 1959; M.S., Syracuse University, 1961; Ph.D., 1964.

Gerald A. Peterson, *Associate Professor of Physics*, B.S., Purdue, 1953; M.S., 1955; Ph.D., Stanford, 1962.

Francis Pichanick, *Associate Professor of Physics*, B.Sc., University of Capetown, South Africa, 1957; M.Sc., 1958; Ph.D., Oxford University, England, 1961.

Arthur R. Quinton, *Professor of Physics*, B.S., Queen Mary College, London University, England, 1944; M.S., University of Western Ontario, Canada, 1951; Ph.D., Yale, 1954.

Philip Rosen, *Professor of Physics*, B.S., City College of New York, 1944; M.S., Yale, 1946; Ph.D., 1949.

Kandula S. R. Sastry, *Associate Professor of Physics*, B.S., Andhra University, India, 1955; M.S., 1956; Ph.D., Indiana, 1962.

Claude Schultz, *Associate Professor of Physics*, B.A., California at Berkeley, 1957; Ph.D., 1964.

Janice Button Shafer, *Professor of Physics*, B.E.P., Cornell, 1954; Ph.D., California at Berkeley, 1959.

Edward A. Soltysik, *Professor of Physics*, B.S., Lafayette, 1950; M.S., Indiana, 1952; Ph.D., 1956.

Morton M. Sternheim, *Associate Professor of Physics*, B.S., City College of New York, 1954; M.S., New York University, 1956; Ph.D., Columbia, 1961.

John D. Strong, *Professor of Astronomy*, A.B., Kansas, 1926; M.S., Michigan, 1928; Ph.D., 1930.

Arthur R. Swift, *Associate Professor of Physics*, B.A., Swarthmore, 1960; Ph.D., Pennsylvania, 1964.

Joseph H. Taylor, Jr., *Assistant Professor of Astronomy*, B.A., Haverford, 1963; Ph.D., Harvard, 1968.

Martial L. Thiebaut, *Assistant Professor of Physics*, B.S., California Institute of Technology, 1958; M.S., California at Berkeley, 1959; Ph.D., 1962.

Robin W. Tucker, *Assistant Professor of Physics*, B.A., Cambridge University, 1964; M.A., 1968; Ph.D., 1968.

David J. van Blerkom, *Assistant Professor of Astronomy*, B.S., City College of New York, 1963; Ph.D., Colorado, 1969.

James F. Walker, *Assistant Professor of Physics*, B.Phys., Minnesota, 1959; M.S., 1961; Ph.D., 1964.

S. Steven Yamamoto, *Professor of Physics*, B.S., Yale, 1955; M.S., 1957; Ph.D., 1959.

ASSOCIATED FIVE-COLLEGE GRADUATE FACULTY

Bruce B. Benson, *Professor of Physics*, (Amherst College), B.A., Amherst, 1943; M.A., Yale, 1945; Ph.D., 1947.

Colby W. Dempsey, *Associate Professor of Physics*, (Amherst College), B.A., Oberlin, 1952; M.A., Rice Institute, 1955; Ph.D., 1957.

Richard J. Duffy, *Assistant Professor of Physics*, (Amherst College), M.E., Stevens Institute of Technology, 1958; M.S., 1960; Ph.D., 1964.

Joel E. Gordon, *Associate Professor of Physics*, (Amherst College), A.B., Harvard, 1952; Ph.D., University of California, 1958.

Robert H. Romer, *Professor of Physics*, (Amherst College), B.A., Amherst, 1952; Ph.D., Princeton, 1955.

Dudley H. Towne, *Professor of Physics*, (Amherst College), B.S., Yale, 1947; M.A., Harvard, 1949; Ph.D., 1954.

UNIVERSITY OF MASSA-
CHUSETTS/BOSTON GRADUATE
FACULTY

Marvin M. Antonoff, *Associate Professor of Physics*, B.S., New York University, 1952; M.S., 1953; Ph.D., Cornell, 1962.

Leonard A. Catz, *Assistant Professor of Physics*, B.S., Hebrew University, Jerusalem, 1962; Ph.D., Soreg Nuclear Research Center, Israel, 1967.

Edward S. Ginsberg, *Assistant Professor of Physics*, A.A. and Sc.B., Brown, 1959; M.S., Stanford, 1961; Ph.D., 1964.

Donald H. Lyons, *Associate Professor of Physics*, B.A., University of Buffalo, 1949; M.A., 1951; Ph.D., 1954.

Harold P. Mahon, *Assistant Professor of Physics*, B.A., Oregon State University, 1953; M.S., 1954; Ph.D., University of Washington (Seattle), 1961.

Arthur W. Martin, *Associate Professor of Physics*, B.S., Harvard, 1957; M.S., Stanford, 1959; Ph.D., 1962.

Benjamin R. Mollow, *Assistant Professor of Physics*, B.S., Cornell, 1960; Ph.D., Harvard, 1966.

Martin Posner, *Assistant Professor of Physics*, B.A., University of California (Los Angeles), 1956; Ph.D., Princeton, 1961.

D.V.G.L.N. Rao, *Associate Professor of Physics*, B.Sc., Andhra University, India; 1953; M.S., 1954; Ph.D., 1958.

Freda Salzman, *Associate Professor of Physics*, B.S., Brooklyn College, 1949; Ph.D., University of Illinois, 1953.

George Salzman, *Professor of Physics*, B.S., Brooklyn College, 1949; Ph.D., University of Illinois, 1953.

Nareshchander P. Shah, *Assistant Professor of Physics*, B.S., University of Louisville, 1955; M.S., 1957; Ph.D., Stanford, 1966.

John Shane, *Assistant Professor of Physics*, B.S., University of Maine, 1958; Ph.D., Massachusetts Institute of Technology, 1963.

Graduate degrees are offered in both Physics and Astronomy by the depart-

ment. Candidates planning to major in Astronomy are referred to the description of the Astronomy Program (see Astronomy).

Candidates planning to major in Physics should have completed at least (preferably, more than) 15 semester credit hours in undergraduate physics beyond an introductory course (such as Physics 105, 106, 107) and also six credits of mathematics beyond college-level calculus.

The requirements for the Master's degree consist of 30 graduate credits, at least 18 of which shall be in the 700-900 courses, and at least 21 of which shall be in Physics. The 18 credits of 700-900 courses shall include 703, 704 and 6 additional credits of courses in the department other than Physics 800. A general examination must be passed before the degree is awarded.

The general requirements for the Ph.D., in Physics are those of the Graduate School. These are implemented along the following lines. A student takes a normal load of basic courses during the first two years. After passing the qualifying examination the student will be expected to devote his major effort to research. Courses taken during this period will usually be in the student's research field. The basic courses of the program are 701, 702, 703, 704, 705, 706, 707, 709, 710, 715, 719. The department also requires that the student demonstrates a reading knowledge of one language, chosen from French, German, and Russian, sufficient to understand journal materials.

COURSES OPEN TO GRADUATE
STUDENTS ONLY

700. INDEPENDENT STUDY.

Special study in some branch of physics, either theoretical or experimental, under the direction of a faculty member. A written proposal must be submitted to the faculty member guiding the investigation and to the Head of the Department for approval before registration.

Credit, 1-6. Staff.

701. CLASSICAL MECHANICS.

Lagrange's and Hamilton's equations, central force problem, rigid bodies, small oscillations, continuum mechanics, fluid dynamics.

Prerequisites, Physics 552 and 556 and Math 241. *Credit, 3. Mr. Thiebaut.*

702. STATISTICAL PHYSICS.

Survey of thermodynamics, Boltzmann distribution, statistical interpretation of thermodynamics, Gibbsian ensembles and the method of Darwin, Fowler; quantum distributions and their applications, transport phenomena.

Prerequisites, Physics 701, 703 and 706 (may be taken concurrently).

Credit, 3. Mr. Chang.

703. INTRODUCTORY QUANTUM MECHANICS (I).

Breakdown of classical physics, wave mechanics including the Schrodinger equation and its interpretation, one dimensional problems, uncertainty principle, harmonic oscillator, hydrogen atom.

Prerequisites, Physics 701 and 705 (both may be taken concurrently).

Credit, 3. Mr. Tucker.

704. INTERMEDIATE QUANTUM MECHANICS (II).

Abstract quantum mechanics, linear algebra and Hilbert space, representation theory, three-dimensional problems, orbital angular momentum, spins, vector coupling.

Prerequisites, Physics 703.

Credit, 3. Mr. Swift, Mr. Mullin.

705. METHODS OF MATHEMATICAL PHYSICS.

Selected topics with application to physics in the calculus of variations, complex variables, Green's functions, partial differential equations, integral transforms, integral equations.

Prerequisite, Physics should be taken concurrently.

Credit, 4. Mr. Walker.

706. CLASSICAL ELECTRODYNAMICS (I).

Electrostatic fields in vacuum and material media, two and three dimensional potential problems, the magnetostatic field, in-

teraction of steady currents, Maxwell's equations, the electromagnetic field, special relativity, and covariant formulation of electrodynamics.

Prerequisites, Physics 701 and 705.

Credit, 3. Mr. Pichanick.

707. CLASSICAL ELECTRODYNAMICS (II).

The field of a moving charge, the Lienard-Wiechert potentials, Lorentz transformation and special relativity, covariant formulation of Maxwell's equations. Radiation of electromagnetic waves; the near field and far field, radiation damping and self fields, spectral resolution of radiation. Magnetohydrodynamics and plasma physics, collisions, scattering and absorption.

Prerequisite, Physics 706.

Credit, 3. Mr. Pichanick.

709. INTERMEDIATE QUANTUM MECHANICS (III).

Approximation methods, WKB, bound state perturbation theory, time dependent perturbation theory, variational method, self-consistent techniques, scattering theory.

Prerequisite, Physics 704.

Credit, 3. Mr. Byron, Mr. Swift.

710. ADVANCED QUANTUM MECHANICS (IV).

Semi-classical radiation theory, non-relativistic second quantization, advanced scattering theory; relativistic wave-equations.

Prerequisite, Physics 709.

Credit, 3. Mr. Golowich.

714. INTRODUCTORY HIGH ENERGY PHYSICS.

General introduction to the physics of elementary particles treating invariance principles, analysis of π -N scattering, strange particles, final state interactions and resonances, internal symmetries, introduction to the theories of strong, electromagnetic and weak interactions.

Prerequisite, Physics 709.

Credit, 3. Mr. Hertzbach.

715. INTRODUCTORY SOLID STATE PHYSICS.

Solids treated as translational symmetry structures, and their effect in x-ray and

particle scattering, thermal and vibrational properties of solids. Binding energy of solids. Electrons in periodic potentials and the formation of bands. The free electron model of metals.

Prerequisite, Physics 704.

Credit, 3. Mr. Mullin.

717. PLASMA PHYSICS.

Properties of plasma, equation of motion, particle versus continuum description, magnetohydrodynamics, stabilities, linear theory of waves and oscillations, Landau damping, non-linear effects and transport phenomena.

Prerequisites, Physics 702, 707.

Credit, 3. Staff.

719. NUCLEAR PHYSICS.

Basic concepts of nuclear physics, instruments and methods. Topics include natural radioactivity, nuclear radiations — their properties and interaction with matter, nuclear radiation detectors, electrostatic and magnetic analyzers, mass spectrometry, charged particle accelerators, elementary discussion of alpha and beta decay, nuclear isomerism, internal conversion, nuclear reactions, neutron physics, fissions, nuclear spin and magnetic moments, cosmic rays and elementary particles.

Prerequisite, Physics 703.

Credit, 3. Mr. Quinton.

723. TOPICS IN MATHEMATICAL PHYSICS.

Subjects vary somewhat depending on the instructor, but probably include applications of the theory of functions, group theory and symmetries, Hilbert and Banach spaces in quantum mechanics.

Prerequisites, Physics 705 and permission of instructor.

Credit, 3. Staff.

724. GROUP THEORY IN QUANTUM MECHANICS.

Finite dimensional groups and their representations; representations of the permutation group; representations of SU_n , tensor representations, decomposition of direct product representations; three dimensional rotation group, Clebsch-Gordon and Racah coefficients; the Lorentz group and its representations; applications to atomic,

solid state, nuclear and high energy physics. Prerequisite, Physics 709. *Credit, 3. Staff.*

811, 812. FIELD THEORY (I), (II).

Relativistic quantum mechanics of a single particle, Klein-Gordon and Dirac equations, formal scattering theory, field quantization, interacting fields, S-matrix, reduction formulae, perturbation theory and Feynman diagrams, renormalization, dispersion relations, and recent developments.

Prerequisites, Physics 709 (may be taken concurrently) for 811, and Physics 811 for 812. *Credit, 3 each semester. Mr. Brehm.*

813. HIGH ENERGY PHYSICS.

Experimental and theoretical aspects of: meson and baryon resonances; leptonic and non-leptonic, strangeness changing and non-changing weak decays; high energy experiments and the phenomenology of Regge poles. Topics vary with the instructor.

Prerequisite, Physics 714.

Credit, 3. Mr. Golowich.

816. SOLID STATE PHYSICS.

Transport phenomena in solids including semiconductors, optical properties of solids, superconductivity, superfluidity, magnetism. Topics vary with the instructor.

Prerequisite, Physics 715.

Credit, 3. Mr. Engelsberg.

817. ADVANCED STATISTICAL PHYSICS.

Phase transitions, including condensation; description of imperfect gases. Transport theory and other nonequilibrium phenomena. Irreversible processes. Field theoretic quantum statistical physics.

Prerequisites, Physics 702, 811.

Credit, 3. Mr. Guyer.

818. ATOMIC STRUCTURE.

An advanced course covering the field of atomic structure including the theory of complex spectra, fine structure, hyperfine structure, electron spin, Zeeman effect, the theory of atomic collisions, general theory of multiplets and magnetic and radiative properties of atoms.

Prerequisite, Physics 709. *Credit, 3. Staff.*

820. NUCLEAR THEORY.

A theoretical understanding of nuclear structure. Topics include internucleon forces, the deuteron and the two body problem, nuclear models and structure of complex nuclei, electromagnetic properties of nuclei, theory of alpha and beta decay, theory of nuclear reactions.

Prerequisites, Physics 709 and 719.

Credit, 3. Mr. Walker.

821. RELATIVITY.

Mathematical and conceptual aspects of the special and general theories of relativity. Lorentz transformations, covariant formulation of the laws of nature. The equivalence principle, curved spaces, solutions of the equations of relativity.

Prerequisites, Physics 701, 706.

Credit, 3. Mr. Harrison, Mr. Tucker.

850. ADVANCED TOPICS IN PHYSICS.

One or more subjects of special interest are covered in lectures.

Prerequisite, permission of instructor.

Credit, 3. Staff.

860. SEMINAR ON RESEARCH TOPICS.

Instruction via reading assignments and seminars on research topics not currently covered in regular courses.

Prerequisite, permission of instructor.

Credit, 1-3. Staff.

800. MASTER'S THESIS.

Credit, 6.

900. DOCTORAL DISSERTATION.

Credit, 30.

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

564. WAVE MOTION.

Physical optics, acoustics, and other wave phenomena in a single unified structure.

Prerequisite, Physics 552. *Credit, 3.*

571, 572. STATISTICAL PHYSICS

(I), (II).

Thermodynamics, kinetic theory and statistical mechanics in a single unified structure.

Prerequisites, Physics 552, 556.

Credit, 3 each semester.

585. MODERN PHYSICS (I).

Review of classical mechanics, theory of relativity, black body radiation, photoelectric effect, Compton effect, background for development of quantum mechanics, Bohr atom.

Prerequisites, Physics 552, 556. *Credit, 3.*

586. MODERN PHYSICS (II) AND QUANTUM MECHANICS.

Quantum mechanics, applications to atomic and nuclear physics, such as atomic spectra, Zeeman effect, angular momentum, barrier penetration.

Prerequisite, Physics 585.

Credit, 4.

588. SOLID STATE PHYSICS.

An introduction to theoretical and experimental physics of the solid state.

Prerequisite, Physics 585.

Credit, 3.

619. ELECTRONICS INSTRUMENTATION.

A laboratory-oriented course designed expressly for physicists and chemists. Basic electronics principles, servo systems, operational amplifiers, digital circuits, other modern devices.

Prerequisite, permission of instructor.

Credit, 3.

685, 686. ADVANCED EXPERIMENTAL WORK (I), (II).

Selected experiments and projects, according to the needs of the individual student.

Prerequisite, Physics 551.

Credit, 1 to 3 each semester.

COURSES NOT FOR MAJOR CREDIT

(No graduate credit for students majoring in Physics)

551. ELECTRICITY AND MAGNETISM (I).

Classical field theory, static electric fields and magnetic fields of steady currents. Scalar and vector potentials, Laplace's equation and its solutions.

Prerequisites, Physics 104 or 106 or 113; Math 174 or 186.

Credit, 3.

552. ELECTRICITY AND
MAGNETISM (II).

Continuation of 551. Time varying fields, Maxwell's equations and applications to radiation.

Prerequisites, Physics 551 and Math 187 or 343. *Credit, 3.*

555, 556. MECHANICS (I), (II).

Development of the fundamental concepts of dynamics with applications to particles and rigid bodies in translation and rotation.

Prerequisites, Physics 104, 106 or 114; Math 174 or 186. *Credit, 3 each semester.*

Plant Pathology

GRADUATE FACULTY

Richard A. Rohde, *Head of the Department and Professor of Plant Pathology*, A.B., Drew University, 1951; M.S., Maryland, 1956; Ph.D., 1958.

George N. Agrios, *Associate Professor of Plant Pathology*, B.S., University of Thessaloniki, Greece, 1957; Ph.D., Iowa State, 1960.

Walter M. Banfield, *Professor of Plant Pathology*, B.S., Rutgers, 1925; Ph.D., Wisconsin, 1930.

William A. Feder, *Professor of Plant Pathology*, A.B., Johns Hopkins, 1941; Ph.D., California at Berkeley, 1950.

Constantine J. Gilgut, *Professor of Plant Pathology*, B.S., Massachusetts, 1931; M.S., 1934; A.M., Harvard, 1937; Ph.D., 1942.

Francis W. Holmes, *Professor of Plant Pathology*, B.A., Oberlin, 1950; Ph.D., Cornell, 1954.

William J. Manning, *Assistant Professor of Plant Pathology*, B.S., Michigan State, 1963; M.S., Delaware, 1956; Ph.D., 1968.

Malcolm A. McKenzie, *Professor of Plant Pathology and Director of Shade Tree Laboratories*, Ph.B., Brown, 1926; A.M., 1926; Ph.D., 1935.

Mark S. Mount, *Assistant Professor of Plant Pathology*, B.S., Illinois Wesleyan, 1963; M.S., Michigan State, 1965; Ph.D., 1968.

UNIVERSITY OF MASSACHUSETTS

William N. Rice, *Associate Professor of Plant Pathology*, B.A., Sioux Falls College, 1936; M.S., Iowa State, 1939; Ph.D., 1944.

Bert M. Zuckerman, *Professor of Plant Pathology*, B.S., North Carolina State, 1948; M.S., N.Y. State College of Forestry, 1949; Ph.D., Illinois 1954.

Students accepted for graduate study towards M.S. or Ph.D. degrees are expected to have fulfilled the usual requirements for a Bachelor's degree in a related discipline. Requirements for the M.S. degree ordinarily include a Thesis, but course work, including plant Pathology 700, may be substituted with permission of the adviser and Graduate Studies Committee.

PLANT PATHOLOGY

COURSES OPEN TO GRADUATE
STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS.

Selected research problems in plant pathology. *Credit, 1-5.* Staff.

790. SEMINAR.

Reports and discussion on the current literature and research in plant pathology; special reports by resident and visiting speakers. One class hour.

Credit, 1 each semester. Staff.

800. MASTER'S THESIS. *Credit, 10.*

804. FOREST PATHOLOGY.

The diseases of trees and the decay of forest products.

Prerequisites, Plant Path 551 and Botany 531, Mycology. *Credit, 3.* Mr. Banfield.

805. ADVANCED PLANT
PATHOLOGY—PARASITISM
AND PATHOGENESIS.

The physiology of diseased plants and the nature of host-parasite interactions. Emphasis on the biochemical and physiological changes induced in the host by plant pathogens. Laboratory consists of biochemical investigations of diseased plants.

Prerequisite, Plant Pathology 551.

Credit, 4. Mr. Mount.

806. ADVANCED PLANT

PATHOLOGY—EPIDEMIOLOGY.

The interactions of host, parasite and environment in the rise and decline of devastating epiphytotics. The mechanisms that govern disease disposition, disease resistance and immunity.

Prerequisites, Botany 531 and Plant Path 551.

Credit, 3. Mr. Banfield.

900. DOCTORAL DISSERTATION.

Credit, 30.

COURSES OPEN TO BOTH GRADUATE AND UNDER- GRADUATE STUDENTS

(For either major or minor credit)

551. PLANT PATHOLOGY.

The nature, causes and control of plant diseases.

Prerequisite, a course in Botany.

Credit, 3. Mr. Agrios.

569. FOREST AND SHADE TREE PATHOLOGY.

The nature, cause and control of the principal types of disease in trees including decay of forest products, and of standing and structural timber.

Credit, 3. Mr. Banfield.

575. METHODS IN PLANT PATHOLOGY.

General techniques and specialized methods used in the investigation of plant diseases.

Prerequisite, one semester of Plant Pathology.

Credit, 3. Staff.

661. PLANT VIROLOGY.

Structure and properties of plant viruses. Virus transmission. Virus infection and synthesis. Symptomatology and physiology of virus infected plants. Assay and purification of plant viruses. Identification and control of plant viruses.

Prerequisite, Plant Path 251 (551) or permission of instructor.

Credit, 4. Mr. Agrios.

678. NEMATOLOGY.

Anatomy, morphology and classification of plant-parasitic and other soil-inhabiting nematodes. Parasitic relationships with

plants and current control measures stressed. Prerequisite, a year of biological science.

Credit, 3. Mr. Rohde.

680. BIOLOGICAL TRANSMISSION OF PLANT DISEASES.

The intricate interrelationships between insects, plants, microorganisms, and environment are considered in relation to the various roles played by arthropods in the inception, transmission, and perpetuation of plant diseases.

Prerequisite, a year of biological science.

Credit, 3. Mr. Banfield.

JOINT PH.D. PROGRAM IN PLANT PATHOLOGY AND ENTOMOLOGY.

The following curriculum is designed to provide the training necessary for research instruction, and the solution of complex problems in entomology and plant pathology such as the transmission of plant diseases by insects and the control of plant pests generally. In this interdisciplinary area there are many opportunities in industry, extension, teaching and in basic biological research.

Curriculum. Courses required for the completion of this program include (a) general background courses and (b) specific advanced courses or their equivalent: (a) general botany, one year; chemistry, one year of inorganic and one of organic; foreign language; mathematics, one year; physics, one year; statistics; and zoology, one year, including genetics. (b) Entomology 126, 655, 657, 680, 682, 770; Plant Pathology 551, 575, 661, 680, 805, 806; Botany 126, 511, 521, 531, 581, 591.

Plant and Soil Sciences

GRADUATE FACULTY

Franklin W. Southwick, *Head of the Department of Plant and Soil Sciences and Professor of Plant Science*, B.S., Massachusetts, 1939; M.S., Ohio State, 1940; Ph.D., Cornell, 1943.

- John H. Baker, *Associate Professor of Soil Science*, B.S., Massachusetts, 1952; M.S., Cornell, 1954; Ph.D., 1959.
- Allen V. Barker, *Associate Professor of Plant and Soil Science*, B.S., Illinois, 1958; M.S., Cornell, 1959; Ph.D., 1962.
- Alfred W. Boicourt, *Professor of Plant Science*, B.S., Cornell, 1938; M.S., 1941.
- William J. Bramlage, *Associate Professor of Plant Science*, B.S., Ohio State, 1959; M.S., Maryland, 1961; Ph.D., 1963.
- William G. Colby, *Professor of Plant and Soil Science*, B.S., Illinois, 1929; M.S., Rutgers, 1932; Ph.D., 1934.
- Mack Drake, *Professor of Plant and Soil Science*, B.S., Purdue, 1937; M.S., Purdue and Alabama Polytechnic, 1939; Ph.D., 1946.
- Walton C. Galinat, *Professor of Plant Science*, B.S., Connecticut, 1949; M.S., Wisconsin, 1951; Ph.D., 1955.
- George B. Goddard, *Associate Professor of Plant Science*, B.S., Massachusetts, 1954; M.S., 1958; Ph.D., 1963.
- Duane W. Greene, *Assistant Professor of Plant Science*, B.S., Colgate University, 1964; M.S., Michigan State University, 1966; Ph.D., 1969.
- Haim B. Gunner, *Associate Professor of Plant and Soil Science*, B.S., University of Toronto, 1946; M.S., University of Manitoba, 1948; Ph.D., Cornell, 1962.
- John R. Havis, *Professor of Plant Science*, B.S., Texas Technological College, 1942; M.S., Cornell, 1947; Ph.D., 1949.
- Paul H. Jennings, *Assistant Professor of Plant Science*, B.V.A., Massachusetts, 1960; M.S., North Carolina State University, 1962; Ph.D., 1965.
- William H. Lachman, *Professor of Plant Science*, B.S., Pennsylvania State, 1934; M.S., 1936.
- William J. Lord, *Professor of Plant Science*, B.S., New Hampshire, 1943; M.S., 1953; Ph.D., Pennsylvania State, 1955.
- Herbert V. Marsh, *Associate Professor of Plant Science*, B.S., Massachusetts, 1954; M.S., 1958; Ph.D., North Carolina State University, 1961.
- Donald N. Maynard, *Associate Professor of Plant Science*, B.S., Connecticut, 1954; M.S., North Carolina State College, 1956; Ph.D., Massachusetts, 1963.
- Louis F. Michelson, *Associate Professor of Plant and Soil Science*, B.S., Massachusetts, 1950; M.S., 1955; Ph.D., 1959.
- John T. Reynolds, *Adjunct Associate Professor of Plant Science*, B.S., Boston College, 1951; M.S., Massachusetts, 1952; Ph.D., 1962.
- William A. Rosenau, *Associate Professor of Plant and Soil Science*, B.S., Yale, 1948; M.S., Connecticut, 1950; Ph.D., Pennsylvania State, 1961.
- Gordon L. Stewart, *Associate Professor of Soil Science*, B.S., Utah State, 1955; M.S., 1957; Ph.D., Washington State University, 1962.
- Cecil L. Thomson, *Professor of Plant Science*, B.S.A., University of Toronto, 1937; M.S., University of Minnesota, 1945.
- Joseph Troll, *Associate Professor of Plant Science*, B.S., Rhode Island, 1954; M.S., 1957; Ph.D., Massachusetts, 1965.
- Jonas Vengris, *Professor of Plant Science*, Diploma, Agr. College, Lithuania, 1934; 1936; Dr. Agr. Sci., University of Bonn, Germany, 1939.
- Martin E. Weeks, *Professor of Plant and Soil Science*, B.S., South Dakota State, 1934; Ph.D., Wisconsin, 1937.
- John M. Zak, *Associate Professor of Plant and Soil Science*, B.S., Massachusetts, 1936; M.S., 1938.
- The Department of Plant and Soil Sciences offers doctoral work in either Plant Science or Soil Science. Specialization and thesis problems related to horticultural and agronomic plants and in soil science are available to both M.S. and Ph.D. degree candidates.
- The department has no foreign language requirement for the doctoral degree.

COURSES OPEN TO GRADUATE
STUDENTS ONLY

(For either major or minor credit)

700, 701. SPECIAL PROBLEMS.

Selected research problems not related to a candidate's thesis.

Credit, 3 each semester. Staff.

702, 703. RESEARCH LITERATURE.

A critical review of the scientific literature in an area of specialization.

Credit, 3 each semester. Staff.

710. MORPHOLOGY OF
ECONOMIC PLANTS.

The anatomy of the plant body with emphasis on those structures which have horticultural and agronomic significance.

Prerequisite, Botany 291 or permission of instructor.

Credit, 3. Mr. Goddard.

713. CLAY MINEROLOGY.

Structure of clay minerals, identification, weathering and alteration of minerals, properties of clay surfaces, geotechnical studies of clays in geology, soil science, and soil mechanics.

Prerequisite, permission of instructor.

Credit, 3.

715. PLANT GROWTH
REGULATORS.

Recent advances in the field of plant growth regulators; including phytochromes, auxins, gibberellins, kinins and herbicides. Emphasis on investigations of the mechanisms whereby these materials control plant growth and development.

Prerequisites, Botany 511 and one semester of biochemistry.

Credit, 3. Mr. Marsh.

717. PLANT-WATER
RELATIONSHIPS.

Contemporary concepts of the distribution, movement and function of water in plants. Soil and atmospheric factors in the development of plant-water stress and its significance to physiological processes.

Prerequisites, Botany 511 or permission of instructor.

Credit, 3. Mr. Havis.

730. ADVANCED SOIL CHEMISTRY.

The chemistry of soil formation, soil acidity, nutrient element availability, ionic exchange, and fixation, soil-plant microorganism relationships, and of organic matter of the soil. Laboratory work consists of physical, analytical and biochemical investigations of soils and important soil constituents.

Prerequisite, permission of instructor.

Credit, 3. Mr. Baker.

740. EXPERIMENTAL METHODS.

Application of statistics to the analysis and interpretation of data obtained in agricultural research. Choice of field, design of experiments, effect of competition, interpretation of results, and other special factors that need to be considered in well planned experiments.

Prerequisite, permission of instructor.

Credit, 3. Mr. Yegian.

745. MICROBIAL ECOLOGY
OF THE SOIL.

The biochemistry and physiology of interactions among microorganisms in, and their relation with, the soil environment. Lectures, discussion and a critical review of current literature on the subject.

Prerequisite, Plant and Soil Sci 585 or permission of instructor.

Credit, 3. Mr. Gunner.

750. PLANT PHOTOSYNTHESIS.

Lectures and discussions of the mechanisms, requirements, evolution, and specific processes related to photosynthesis. An extensive study of the literature contributing to the basic knowledge of photosynthesis is required.

Prerequisite, Botany 512 or Chem 524 or equivalent.

Credit, 3. Mr. Barker, Mr. Stern.

760. NITROGEN METABOLISM.

A comprehensive presentation of nitrogen metabolism in plants. The biological mechanisms of nitrogen absorption, synthesis and degradation of nitrogenous compounds, nitrogen fixation, specific roles of nitrogenous compounds and nitrogen toxicities.

Prerequisite, Botany 512 or Chem 524 or equivalent.

Credit, 3. Mr. Barker.

790, 791. SEMINAR.
Required of all graduate students majoring
in the department.
Credit, 1 each semester. Staff.

800. MASTER'S THESIS. *Credit, 10.*

900. DOCTORAL DISSERTATION.
Credit, 30.

COURSES OPEN TO BOTH
GRADUATE AND UNDER-
GRADUATE STUDENTS
(For either major or minor credit)

530. PLANT NUTRITION.
The accumulation and transport of inorganic
ions in plants and their function in plant
metabolism.
Prerequisite, Botany 211 or equivalent.
Credit, 3. Mr. Maynard.

535. TAXONOMY OF ECONOMIC
PLANTS.
Plant families, genera, species and cultivars
of importance in the horticultural and agro-
nomic fields. *Credit, 3. Mr. Boicourt.*

540. PLANT BREEDING.
An advanced study of genetic topics pecu-
liar to plants, together with the methods and
problems of the plant breeder.
Prerequisite, Zool 240 or equivalent.
Credit, 3. Mr. Lachman.

545. POST-HARVEST PHYSIOLOGY.
Physical and chemical processes of plants
before and after harvest and the influence
of environmental, chemical and storage fac-
tors on these processes.
Credit, 3. Mr. Bramlage.

550. FORAGE AND FIELD CROPS.
Analysis of the principles involved in the
establishment, fertilization, and harvest
management of forage and field crops.
Credit, 3. Mr. Colby.

555. AGROSTOLOGY.
The establishment and maintenance of turf
grasses used on lawns, athletic fields, high-
way, airports and cemeteries.
Credit, 3. Mr. Troll.

560. ECOLOGY AND CONTROL OF
WEEDS.
Identification and ecology of common
weeds and principles of weed control with
emphasis on the use of chemical herbicides.
Credit, 3. Mr. Vengris.

565. SOIL FORMATION AND
CLASSIFICATION.
The development of soils as related to
physical, chemical, biological climatic and
geological factors.
Credit, 4. Mr. M. Weeks.

570. SOIL PHYSICS.
Physical properties of soil, including
textural, structural, water, air and tem-
perature relationships; their measurements,
evaluation and influence in the soil system.
Prerequisite, Plant and Soil Sci 105 or
equivalent. *Credit, 3. Mr. Stewart.*

575. SOIL CHEMISTRY.
The inorganic and organic chemical
reactions related to the nutrient supply in
soils and soil nutrition of plants. Colloidal
aspects of soil chemical reactions and soil-
plant mineral relationships.
Prerequisites, Chem 127 and Plant and
Soil Sci 265 or equivalent.
Credit, 3. Mr. Baker.

580. SOIL-PLANT MINERAL
NUTRITION.
Mineral nutrients in the growth of plants;
the use of fertilizers and other soil amend-
ments; soil reaction; mineral deficiencies
and toxicities in plants.
Credit, 3. Mr. Drake.

585. MICROBIOLOGY OF THE
SOIL.
Soil microorganisms; their distribution, ecol-
ogy and transformation of organic and
inorganic substrates. Microbiology of the
rhizosphere and the biological equilibrium.
Prerequisite, Microbiol 250 or permission of
instructor. *Credit, 3. Mr. Gunner.*

Polymer Science and Engineering

GRADUATE FACULTY

Roger S. Porter, *Chairman of the Program and Professor of Polymer Science and Engineering*, B.S., University of California at Los Angeles, 1950; Ph.D., University of Washington, Seattle, 1956.

James C. W. Chien, *Professor of Chemistry*, B.S., St. John's, 1949; B.A., Wayland College, 1950; M.S., Kentucky, 1951; Ph.D., Wisconsin, 1954.

Frank E. Karasz, *Associate Professor of Polymer Science and Engineering*, B.Sc., Imperial College, University of London, 1954; Ph.D., University of Washington, Seattle, 1957.

Robert L. Laurence, *Associate Professor of Chemical Engineering*, B.S., M.I.T., 1957; M.S., Rhode Island, 1960; Ph.D., Northwestern, 1965.

Robert W. Lenz, *Professor of Chemical Engineering*, B.S., Lehigh, 1949; M.S., Institute of Textile Technology, 1951; Ph.D., State University of New York, 1956.

William J. MacKnight, *Associate Professor of Chemistry*, B.S., University of Rochester, 1958; M.A., Princeton, 1963; Ph.D., 1964.

Stanley Middleman, *Professor of Chemical Engineering*, B.S., Johns Hopkins, 1958; D.Eng., 1961.

Seymour Newman, *Adjunct Associate Professor of Polymer Science and Engineering*, B.S., College of the City of New York, 1942; A.M., Columbia, 1947; Ph.D., Polytechnic Institute of Brooklyn, 1949.

Fraser P. Price, *Professor of Polymer Science and Engineering*, A.B., Columbia, 1938; Ph.D., 1941.

Richard S. Stein, *Commonwealth Professor of Chemistry and Director of the Polymer Research Institute*, B.S., Brook-

lyn Polytechnic Institute, 1945; M.A., Princeton, 1948; Ph.D., 1949.

Otto Vogl, *Professor of Polymer Science and Engineering*, B.S., University of Vienna, 1945; Ph.D., 1950.

Both the Master's and Doctor's programs in Polymer Science and Engineering are interdisciplinary in nature and are designed to provide a broad and fundamental education in polymers. Entering students will normally have a Bachelor's or Master's degree in Chemistry, Engineering, or Physics. Flexibility in the first year's curriculum allows for basic work in fields other than the student's undergraduate major and for prerequisites for advanced work in the PSE program. There is a basic core of courses within the PSE program, with sufficient electives to provide options for students with either a chemistry-physics emphasis or an engineering emphasis. The program requires an intermediate-level reading knowledge of one foreign language for all doctoral candidates.

PH.D. PROGRAM.

1. Admission Requirements

- a. B.S. or B.A. in Chemistry, Engineering, or Physics.
- b. Undergraduate work in two of the following areas:
 - Organic Chemistry
 - Physical Chemistry
 - Thermodynamics
 - Electronics
 - Unit Operations
 - Mechanics of Materials

2. Prescribed Program

- a. Undergraduate courses in certain areas of 1.b where there have not been previous studies.
- b. Core and Basic Requirements:

PSE 501. INTRODUCTION TO
POLYMER SCIENCE.

Credit, 3.

CHEM 590. ADVANCED PHYSICAL
CHEMISTRY.

Credit, 3.

CHEM 571. ORGANIC CHEMISTRY.

Credit, 3.

CHEM 797. ORGANIC POLYMERIZATION REACTIONS,

Credit, 3.

or

CHEM 798, 799. PHYSICAL CHEMISTRY OF HIGH POLYMERS.

Credit, 3 each semester.

PSE 702. RHEOLOGY.

Credit, 3.

PSE 790. TECHNIQUES OF POLYMER CHARACTERIZATION.

Credit, 3.

PSE 711. POLYMER PROCESSING.

Credit, 3.

PSE 795-6-7. SPECIAL TOPICS IN POLYMER SCIENCE AND ENGINEERING.

Credit, 2-6.

PSE 891-2. POLYMER SCIENCE SEMINAR.

Credit, 1 each semester.

Electives approved by PSE Committee.

Credit, 10-20.

Language and Comprehensive Examinations as approved by PSE Committee and as required by Graduate School.

PSE 900. DISSERTATION.

M.S. PROGRAM.

1. Requirements for admission are the same as those for entry into Ph.D. Program.

2. Suggested Programs

a. With Thesis:

PSE 501. INTRODUCTION TO POLYMER SCIENCE.

Credit, 3.

CHEM 590. ADVANCED PHYSICAL CHEMISTRY.

Credit, 3.

PSE 702. RHEOLOGY.

Credit, 3.

PSE 711. POLYMER PROCESSING.

Credit, 3.

CHEM 797. ORGANIC POLYMERIZATION REACTIONS,

Credit, 3.

or

CHEM 798, 799. PHYSICAL CHEMISTRY OF HIGH POLYMERS.

Credit, 3 each semester.

PSE 891-2. POLYMER SCIENCE SEMINAR.

Credit, 1 each semester.

PSE 800. M.S. THESIS.

Credit, 10.

b. Without Thesis:

PSE 501. INTRODUCTION TO POLYMER SCIENCE.

Credit, 3.

CHEM 590. ADVANCED PHYSICAL CHEMISTRY.

Credit, 3.

CHEM 797. ORGANIC POLYMERIZATION REACTIONS,

Credit, 3.

or

CHEM 798, 799. PHYSICAL CHEMISTRY OF HIGH POLYMERS.

Credit, 3 each semester.

PSE 711. POLYMER PROCESSING.

Credit, 3.

PSE 702. RHEOLOGY.

Credit, 3.

PSE 891-2. POLYMER SCIENCE SEMINAR.

Credit, 1 each semester.

PSE 790. TECHNIQUES OF POLYMER CHARACTERIZATION.

Credit, 3.

Electives.

(Selected from suggested list in Ph.D. Program)

Credit, 7.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

702. RHEOLOGY.

The science of deformation and flow. Kinematics and dynamics of deformation of continuous media, purely viscous, elastic, viscoelastic and plastic media are considered. Experimental methods, molecular theories and engineering applications.

Prerequisite, mathematics through differential equations, general physics, familiarity with vectors and tensors.

Credit, 3. Mr. Porter, Mr. Middleman.

711. POLYMER PROCESSING.

Selected topics in the field of chemical engineering of polymeric materials. Methods and principles of batch and continuous production of addition and condensation polymers by emulsion, suspension, and bulk polymerization. Physical chemical concepts underlying formation, properties and processing of polymeric materials.

Prerequisites, PSE 501, Chem 797 or 798.

Credit, 3. Staff.

721. MICROSCOPY AND MORPHOLOGY OF POLYMERS.

Emphasis on the use of the light and electron microscope. Phase contrast, interference methods, selected area diffraction, scattering techniques, and replication and decoration methods for the study and characterization of the morphology of polymeric structures.

Two lectures, four laboratory hours per week.

Prerequisites, PSE 501, general physics, optics desirable. *Credit, 3. Mr. Price.*

790. TECHNIQUES OF POLYMER CHARACTERIZATION.

Experimental techniques for characterization of isolated polymer molecules and polymeric solids, including gel permeation chromatography, osmometry, thermal analysis, NRM, dynamic and static mechanical studies, microscopy, light scattering, and solution techniques.

Prerequisites, Chem 586 and Chem 798 (may be taken concurrently) and permission of instructor.

One lecture and 6 laboratory hours per week.

Credit, 3. Staff.

795, 796, 797. SPECIAL TOPICS IN POLYMER SCIENCE.

A lecture course for advanced students in the Polymer Science and Engineering Program in which advanced aspects of some area pertinent to polymer science and engineering are intensively explored. The course rotates among staff members in the PSE Program and generally is in a field of particular interest to the staff members concerned.

Two class hours. A maximum of six credits (two per semester).

Prerequisites, PSE 501 and permission of instructor. *Credit, 2-6. Staff.*

891, 892. POLYMER SCIENCE SEMINAR.

Students, staff members and visitors present seminars dealing with current research and literature reviews in polymer science and engineering and in related areas of materials science.

About two seminar hours per week.

Credit, 2 (one per semester). Staff.

800. MASTER'S THESIS. *Credit, 6-10.*

900. DOCTORAL DISSERTATION. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS (For either major or minor credit)

501. INTRODUCTION TO POLYMER SCIENCE.

An introductory course in the physical and organic chemistry of polymers designed for persons with basic training in chemistry, physics, or engineering. A survey of preparative methods of polymers, means of preparation of polymers of controlled structure, the physical chemistry of polymer molecules in solution, liquid, and solid phases, thermodynamics and statistics of polymers, methods of characterization, mechanical properties of polymeric solids and fundamentals of industrial preparative and fabrication techniques.

Prerequisite, one year of physical chemistry and one semester of organic chemistry or permission of instructor. *Credit, 3. Staff.*

DIRECTLY RELATED COURSES:

CHEM 590. ADVANCED PHYSICAL CHEMISTRY.

CHEM 797. ORGANIC POLYMERIZATION REACTIONS.

CHEM. 798, 799. PHYSICAL CHEMISTRY OF HIGH POLYMERS.

Ch.E. 670. APPLIED POLYMER SCIENCE.

Psychology

GRADUATE FACULTY

Richard T. Louttit, *Chairman of the Department and Professor of Psychology*, A.B., De Pauw University, 1954; A.M., University of Michigan, 1959; Ph.D., 1961.

Daniel Anderson, *Assistant Professor of Psychology*, B.S., University of Wisconsin, 1966; A.M., Brown University, 1966; Ph.D., 1970.

Dee G. Appley, *Professor of Psychology*, B.A., University of Denver, 1945; M.A., University of Michigan, 1949; Ph.D., 1952.

Mortimer H. Appley, *Dean of the Graduate School and Professor of Psychology*, B.S.S., City College of New York, 1942; M.A., University of Denver, 1946; Ph.D., University of Michigan, 1950.

John J. B. Ayres, *Assistant Professor of Psychology*, B.A., William and Mary, 1961; M.A., University of Kentucky, 1963; Ph.D., 1965.

Seymour M. Berger, *Professor of Psychology*, B.A., Oklahoma A and M College, 1949; M.A., Columbia, 1950; Ph.D., Cornell University, 1959.

Neil Carlson, *Assistant Professor of Psychology*, B.A., University of Illinois, 1964; M.A., 1966; Ph.D., 1966.

Sheldon Cashdan, *Assistant Professor of Psychology*, B.S., City College of New York, 1958; M.A., University of North Carolina, 1963; Ph.D., 1965.

James I. Chumbley, *Assistant Professor of Psychology*, B.A., Drake, 1960; M.S., Indiana University, 1963; Ph.D., 1967.

Charles E. Clifton, Jr., *Associate Professor of Psychology*, B.A., Stanford University, 1960; Ph.D., University of Minnesota, 1964.

Rachel K. Clifton, *Assistant Professor of Psychology*, B.A., Berea College, 1959; M.A., University of Minnesota, 1960; Ph.D., 1963.

Marvin Daehler, *Assistant Professor of Psychology*, B.A., University of Illinois, 1964; M.A., University of Minnesota, 1966; Ph.D., 1968.

John T. Danielson, *Assistant Professor of Psychology*, B.S., Rensselaer Polytechnic Institute, 1964; M.S., Brown, 1966; Ph.D., 1969.

John W. Donahoe, *Associate Professor of Psychology*, B.A., University of Kentucky, 1954; M.S., 1956; Ph.D., 1958.

Ernest Dzendolet, *Associate Professor of Psychology*, B.S., California Institute of Technology, 1951; Sc.M., Brown, 1957; Ph.D., 1959.

Alice H. Eagly, *Assistant Professor of Psychology*, B.A., Radcliffe, 1960; M.A., University of Michigan, 1963; Ph.D., 1965.

William Eichelman, *Assistant Professor of Psychology*, B.A., University of Hartford, 1965; M.S., University of Oregon, 1968; Ph.D., 1970.

John A. Emrick, *Assistant Professor of Psychology*, A.B., University of California, Los Angeles, 1964; M.A., 1966; Ph.D., 1968.

Seymour Epstein, *Professor of Psychology*, B.A., Brooklyn College, 1948; M.A., University of Wisconsin, 1951; Ph.D., 1953.

Robert S. Feldman, *Professor of Psychology*, B.S., University of Michigan, 1943; M.A., 1944; Ph.D., 1951.

Kay Fite, *Assistant Professor of Psychology*, B.S., Florida State University, 1963; M.S., Brown University, 1967; Ph.D., 1969.

Howard Gadlin, *Assistant Professor of Psychology*, B.A., Queens College, 1962; Ph.D., University of Michigan, 1966.

Stuart Golann, *Associate Professor of Psychology*, B.A., Queens College, 1957; M.A., University of North Carolina, 1959; Ph.D., 1961.

Morton G. Harmatz, *Associate Professor of Psychology*, B.A., Ohio State University, 1960; M.A., University of Washington, 1962; Ph.D., 1963.

Harry Helson, *Professor of Psychology*, B.A., Bowdoin College, 1921; Ph.D., Harvard University, 1924.

Samuel Z. Himmelfarb, *Associate Professor of Psychology*, B.A., University of California at Los Angeles, 1958; Ph.D., 1964.

Harold Jarmon, *Associate Professor of Psychology*, B.A., New York University, 1955; M.A., University of Kansas, 1959; Ph.D., 1962.

Alan C. Kamil, *Assistant Professor of Psychology*, B.A., Hofstra College, 1963; M.S., University of Wisconsin, 1966; Ph.D., 1967.

Solis L. Kates, *Professor of Psychology*, B.S., City College of New York, 1935; M.S., 1937; Ph.D., Columbia, 1948.

Larry C. Kerpelman, *Assistant Professor of Psychology*, B.A., Johns Hopkins, 1958; Ph.D., University of Rochester, 1963.

Edward E. Kriekhaus, *Associate Professor of Psychology*, B.A., Williams College, 1954; Ph.D., University of Illinois, 1962.

George Levinger, *Professor of Psychology*, B.A., Columbia, 1946; M.A., University of California at Berkeley, 1951; Ph.D., University of Michigan, 1955.

Alan Lieberman, *Assistant Professor of Psychology*, B.S., Brooklyn College, 1953; M.A., University of Connecticut, 1955; Ph.D., 1960.

John W. Moore, *Associate Professor of Psychology*, B.A., Lawrence College, 1958; Ph.D., Indiana University, 1962.

Stanley M. Moss, *Associate Professor of Psychology*, B.A., Ohio State, 1957; M.A., 1958; Ph.D., 1962.

Jerome L. Myers, *Professor of Psychology*, B.A., Syracuse, 1953; M.A., Wisconsin, 1955; Ph.D., 1957.

Nancy A. Myers, *Associate Professor of Psychology*, B.A., Mount Holyoke, 1952; M.A., Wisconsin, 1954; Ph.D., 1957.

Jeanne S. Phillips, *Associate Professor of Psychology*, B.A., Washington University, 1951; Ph.D., 1957.

Alexander Pollatsek, *Assistant Professor of Psychology*, B.S., University of Michigan, 1961; M.A., Harvard University, 1963; M.S., University of Michigan, 1964; M.A., 1965; Ph.D., 1969.

Harold Raush, *Professor of Psychology*, A.B., University of Michigan, 1941; M.A., University of Michigan, 1942; Ph.D., Stanford University, 1950.

Stephen Reisman, *Assistant Professor of Psychology*, B.A., City College University of New York, 1966; M.A., University of North Carolina, 1969; Ph.D., 1970.

James Royer, *Associate Professor of Psychology*, A.B., Ohio State, 1967; M.A., Illinois, 1969; Ph.D., 1970.

Harry Schumer, *Associate Professor of Psychology*, B.S., Ohio State, 1954; M.A., 1956; Ph.D., 1961.

Norman Simonson, *Assistant Professor of Psychology*, B.A., University of Rochester, 1960; Ph.D., Pennsylvania State University, 1968.

J. Alfred Southworth, *Professor of Psychology*, B.S., U.S. Naval Academy, 1943; M.A., Harvard, 1955; Ph.D., 1956.

Ivan Steiner, *Professor of Psychology*, A.B., Central Michigan College, 1941; M.A., University of Michigan, 1948; Ph.D., 1952.

J. A. Trowill, *Associate Professor of Psychology*, B.A., Delaware, 1959; M.S., Massachusetts, 1961; Ph.D., Yale, 1966.

Castellano B. Turner, *Assistant Professor of Psychology*, B.A., DePaul University, 1957; M.A., Ohio State University, of Chicago, 1966.

Norman Watt, *Associate Professor of Psychology*, B.A., Northwestern University, 1957; M.A., Ohio State University, 1960; Ph.D., 1962.

Arnold Well, *Assistant Professor of Psychology*, B.S., McGill University, 1961; M.S., University of Alberta, 1963; M.A., University of Oregon, 1966; Ph.D., 1969.

Robert H. Willoughby, *Assistant Professor of Psychology*, B.A., Gettysburg College, 1960; M.S., Pittsburgh, 1962; Ph.D., Minnesota, 1967.

ASSOCIATED FIVE-COLLEGE
GRADUATE FACULTY

David J. Schneider, *Assistant Professor of Psychology* (Amherst College), B.A., Wabash College, 1962; Ph.D., Stanford, 1966.

The graduate program in psychology is oriented toward the Doctor of Philosophy degree, although students entering with a Bachelor's degree are required to obtain a Master of Science degree en route to the Ph.D. In special cases, students may be accepted for the Master's program only. Areas of concentration leading to the Ph.D. are child, clinical (including child clinical), counseling, educational, experimental (including human engineering, learning, motivation, physiological, quantitative, and sensation and perception), personality, and social.

Students taking the doctorate must satisfy the general requirements of the Graduate School for the degree. They must also complete the course requirements of their area of specialization. A list of these requirements will be supplied on request to the department. The doctoral program provides practicum courses in each of the applied specialization areas. Neighboring institutions and agencies available for such field work include Belchertown State Hospital, Clarke School for the Deaf, Department of Psychology Child Guidance Clinic, Newington V.A. Out-patient Clinic and Hospital, Holyoke Mental Health Clinic, Monson State Hospital, Northampton State Hospital, Northampton V.A. Hospital, Springfield Child Guidance Clinic, Springfield V.A. Mental Hygiene Clinic, University Guidance and Counseling Services, University Nursery School, Worcester V.A. Mental Hygiene Clinic, Worcester Youth Guidance Cen-

ter, and various industrial concerns in nearby towns.

There is no general foreign language requirement for degree qualification in psychology. However, students may be expected to demonstrate satisfactory levels of competence in one or more languages other than English in cases where a significant body of relevant literature exists in a foreign language and is not available in suitable translation. In addition, all graduate students in psychology are expected to achieve at least minimal competence with computer programming.

All students qualifying for the Master of Science degree in Psychology must, in addition to meeting the degree requirements of the Graduate School, take course 545 and 800. A final oral examination given by the problem or thesis committee and the Department is required. Credits taken to satisfy the requirements for the Master's degree can be applied to the total number of credits required for the doctorate.

Students applying for admission to the graduate psychology program, in addition to meeting the requirements of the Graduate School, should have taken an introductory course and 18 additional undergraduate credits in psychology, including a course in laboratory experimental psychology, or the equivalent, and a course in statistics. In case the student has not taken this number of credits or lacks these courses, he may be allowed to make up the deficiencies in undergraduate courses. In exceptional cases, students with entrance deficiencies may, at the end of one semester's study, petition the department to waive remaining undergraduate deficiencies.

All students applying for admission to the graduate program must submit their scores on the Graduate Record Examination and on the Miller Analogies Test. Further information on Departmental and area requirements may be obtained on request from the Department.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. PROBLEM IN PSYCHOLOGY.

A research project which may be taken in lieu of the master's thesis, or by doctoral students as minor research.

*Credit, 3 each semester.
Maximum credit, 12.*

706. DEVELOPMENTAL PSYCHOLOGY.

Selected issues, both historical and contemporary, in developmental psychology.

Credit, 3. Staff.

710. SENSATION AND PERCEPTION.

A survey of basic methods, sensory processes and perceptual phenomena. Basic methods will include techniques for the study of thresholds, suprathreshold scaling, and the theory of Signal Detectability. Most basic sensory processes are discussed, and perceptual phenomena in selected sensory systems described.

Credit, 3. Staff.

711. SENSORY PROCESSES I.

Auditory and cutaneous senses; the fundamental data with their implications concerning functioning of these systems.

Prerequisites, Psych 211 or 6 credits of advanced Psychology and 3 hours of Zoology or the equivalent.

Credit, 3. Mr. Dzendolet.

712. SENSORY PROCESSES II.

Visual, gustatory and olfactory senses; the fundamental data with their implications concerning functioning of these systems.

Prerequisites, Psych 211 or 711 or six credits of advanced Psychology and three hours of Zoology or the equivalent.

Credit, 3. Mr. Danielson, Mr. Helson.

715. PERCEPTION.

Methods, data, and theory concerning such phenomena as perception of movement, time and frequency, space form and pattern and attention.

Two class hours, one 2-hour laboratory period.

Prerequisites, Psych 711 or 712 or equivalent and Psych 721 or 723 or equivalent.

Credit, 3. Mr. Danielson, Mr. Helson.

716. ADVANCED PHYSIOLOGICAL PSYCHOLOGY.

Detailed study of the structure and function of the nervous system as they relate to sensory-motor systems and drives.

Two class hours, one 2-hour laboratory period.

Prerequisite, Psych 550 or equivalent, or permission of instructor.

Credit, 3. Staff.

717. NEURAL CORRELATES OF BEHAVIOR.

The neurophysiological bases of behavior. Topics considered are neuroelectric phenomena, psychopharmacology, neurophysiology of learning and drive-reward systems.

Prerequisite, Psych 550 or equivalent.

Credit, 3. Mr. Feldman.

718. PHYSIOLOGICAL PSYCHOLOGY

An introduction to and overview of the field. Topics include functional neuroanatomy of neurophysiology and the physiological bases of emotion, motivation, reward and punishment, species, typical behavior, learning and memory.

Credit, 3. Staff.

720. LEARNING.

Basic phenomena and current research in animal and human learning.

*Credit, 3. Mr. Donahoe,
Mr. Moore, Mr. Clifton.*

721. CONDITIONING.

The basic laws of classical conditioning. Topics include the physiological bases of conditioning and related phenomena, the relationship of conditioning to more complex behavior, and relevant research techniques for animal and human experimentation. Lectures and laboratories.

Credit, 3. Mr. Moore.

723. ANIMAL LEARNING.

The implication of the basic laws of learning for explaining complex aspects of animal learning. Examples or topics often include the application of classical conditioning models to instrumental situations, aversive control, discrimination learning and primate learning.

Credit, 3. Mr. Ayres, Mr. Donahoe,
Mr. Kamil, Mr. Moore.

725. HUMAN INFORMATION PROCESSING I.

Basic processes in human cognition and performance. Topics include attention, judgment, choice, short-term memory, and long-term memory.

Prerequisite, Psych 720 or permission of instructor.
Credit, 3. Staff.

726. HUMAN INFORMATION PROCESSING II.

Complex aspects of human cognition and performance. Topics include sequential behavior, concept formation, thinking, and psycholinguistics.

Prerequisite, Psych 725 or permission of instructor.
Credit, 3. Staff.

731. EMOTION AND MOTIVATION.

The nature, determinants, and interrelationships of emotion and motivation; techniques involved in investigating these phenomena. Lectures and laboratories.

Credit, 3. Mr. Trowill.

735. SYSTEMATIC PSYCHOLOGY.

The general structure of psychological theory and an historical and comparative consideration of the backgrounds, viewpoints on scientific methodology, research interests and techniques, and the component variables, hypotheses, and laws of structural, Gestalt, functional and behavioristic movements.

Credit, 3. Mr. Helson.

741. TEST CONSTRUCTION I.

Theory and practice of the construction and analysis of tests; correlation procedures; reliability; validity; item analysis; test weights; introduction to factor analysis techniques. Tests are constructed in the laboratory periods.

Prerequisite, Psych 545, previously or concurrently.
Credit, 3. Mr. Well.

742. TEST CONSTRUCTION II.

Measurement theory; psychophysical methods; construction, analysis, and comparison of various attitude scales. Each student constructs, administers and evaluates one or more scales in the laboratory.

Prerequisite, Psych 741.

Credit, 3. Mr. Pollatsek.

744. FACTOR ANALYSIS.

Theory and methods of factor analysis in psychological research. Lectures and laboratory exercises.

Prerequisite, Psych 741 or equivalent.

Credit, 3. Staff.

745. ADVANCED APPLIED STATISTICS.

Various experimental designs, the assumptions underlying their use, and the appropriate statistical analysis; orthogonal and randomized designs, trend analysis, non-parametric techniques, and multi-variate analysis.

Prerequisite, Psych 545 or equivalent.

Credit, 3. Mr. Myers, Mr. Pollatsek.

746. QUANTITATIVE METHODS IN PSYCHOLOGY.

Mathematical descriptions of psychophysical and time-dependent data; parameter estimation; stochastic processes.

Prerequisites, Psych 545 and Math 123 or equivalent.
Credit, 3. Mr. Chumbley.

760. THEORIES OF CHILD DEVELOPMENT.

The more relevant theories of child development, specifically those which have served as the impetus for experimental research with children. Theoretical analysis of the personality, social and cognitive development of children is emphasized.

Credit, 3. Staff.

762. LEARNING AND MOTIVATION IN CHILDREN I.

Analysis of experiments on learning and motivation in simple situations with children. Two class hours, one 2-hour laboratory period.

Prerequisite, Psych 721 or 262 or permission of instructor.

Credit, 3. Mrs. Myers, Mrs. Clifton.

763. LEARNING AND MOTIVATION
IN CHILDREN II.

Analysis of experiments on learning and motivation in complex situations with children. Topics include rote learning, transfer and retention and concept formation.

Two class hours, one 2-hour laboratory period.

Prerequisite, Psych 721 or 262 or permission of instructor.

Credit, 3. Mr. Dachler.

764. PERCEPTUAL DEVELOPMENT
IN CHILDREN.

An introduction to theories of perceptual development, consideration of sensory and perceptual capacities of the infant, and analysis of developmental changes in perception in the infant and older child.

Credit, 3. Mr. Kerpleman, Mrs. Clifton.

766. PERSONALITY AND SOCIAL
DEVELOPMENT IN CHILDREN.

Review and analysis of the literature on personality development and the socialization process in children.

Prerequisites, Psych 262, 270 or equivalent.

Credit, 3. Mr. Willoughby.

775. THE PSYCHOLOGY OF
EXCEPTIONAL CHILDREN.

The etiology, diagnosis, and treatment of exceptional children, with special emphasis on intellectual, social, physical and sensory deviation.

Prerequisites, Psych 262, 325, or permission of instructor.

Credit, 3. Mr. Harmatz, Mr. Raush.

777. DIAGNOSIS AND TREATMENT
OF BEHAVIOR DISORDERS IN
CHILDREN.

The diagnosis and treatment of psychological maladjustments in infancy and childhood; treatment procedures, resources, and methods used in dealing with behavior and personality problems. Lectures, discussions and practicum sessions.

Prerequisites, Psych 325, 262 or 762, and 833.

Credit, 3. Mr. Jarmon.

780. ADVANCED SOCIAL PSYCHOL-
OGY.

An overview of theory and experimental re-

search in social psychology. Topics covered include social perception, attitude structure and change, dyadic interaction, and group processes.

Credit, 3. Staff.

781. ATTITUDES.

Theory, method and data concerned with the nature and structure of attitudes and opinions, the formation of attitudes, attitude change in response to communication and interpersonal influence.

Prerequisite, Psych 780. *Credit, 3. Staff.*

782. SOCIAL JUDGMENT AND IN-
TERPERSONAL PERCEPTION.

The influence of culture, values, needs and attitudes on perceptual judgments; judgmental and inferential processes about persons and interpersonal behavior.

Prerequisites, Psych 780 and 710, permission of instructor.

Credit, 3. Mr. Himmelfarb.

784. GROUP DYNAMICS.

Interpersonal and group processes; attraction, influence, group structure, communication, cooperation, leadership, group performance. Focus on theory, experimentation, and special problems of the field.

Prerequisite, Psych 780.

Credit, 3. Mr. Steiner.

793. ADVANCED EDUCATIONAL
PSYCHOLOGY.

An intensive appraisal of the psychological principles and concepts of development learning as related to educative process and their application to teaching. Primarily intended for graduate students in Education including the Master of Arts of Teaching.

Prerequisite, Psych 301 or equivalent, or permission of instructor.

Credit, 3. Mr. Schumer, Mr. Royer.

794. SOCIAL PSYCHOLOGY IN THE
SCHOOLS.

Review and analysis of the social psychological literature as it pertains to school and educational issues. Emphasis on social interaction in the classroom.

Prerequisite, Psych 280 or equivalent, or permission of instructor.

Credit, 3. Mr. Schumer.

795. PSYCHOLOGY OF CLASSROOM
LEARNING.

Review and analysis of the findings of psychology that pertain to instruction. Emphasis on the practical control of learning activities especially as seen the classroom.
Prerequisite, Psych 280 or equivalent, or permission of instructor.

Credit, 3. Mr. Schumer.

800. MASTER'S THESIS. *Credit, 8-10.*

821. PERSONALITY.

The basic concepts and principles in the study of personality, including both theoretical research issues. Emphasis on recent research in specific areas of personality.

Credit, 3. Mr. Kerpelman, Mr. Epstein.

830. CLINICAL I.

Roles and functions of clinicians in various settings, current professional issues. Introduction to assessment as related to alternative views of abnormality and personality. Lecture and laboratory.

Credit, 6. Miss Phillips.

831. CLINICAL II.

Logic and process of assessment and description of behavior. Basic models and descriptive systems in conjunction with skill development in use of exemplary techniques including objective and projective tests and naturalistic observation. Relation of models and techniques to models of abnormal behavior and personality. Lecture and laboratory.

Prerequisite, Psych 830.

Credit, 6. Mr. Epstein, Miss Phillips.

833. CLINICAL III.

Problem-formulating and problem-solving within various clinical situations and clinical models. Integration and communication of findings from psychological assessment. Lecture and laboratory.

Prerequisite, permission of instructor.

Credit, 6. Mr. Watt.

834. OBJECTIVE PERSONALITY,
INTEREST AND APTITUDE
ASSESSMENT.

Review and analysis of the psychological literature pertaining to structured personality, interest, and aptitude tests.

Two class hours, one 2-hour laboratory period.

Prerequisite, Psych 832 or equivalent.

Credit, 3. Staff.

835. CLINICAL IV.

The theory of the individual techniques of psychotherapy and demonstration of these techniques through video and other tapes, and role-playing. Psychotherapeutic techniques considered may include psychoanalytic, ego psychoanalytic, behavior therapy, operant conditioning, socially oriented, rational-emotive, existentialhumanistic, and client-centered. Three lecture hours and two hours laboratory.

Prerequisite, Psych 833.

Credit, 4. Mr. Kates, Mr. Harmatz.

836. CLINICAL V.

Theoretical and research approaches to group and family therapies. Includes a laboratory providing practicum experiences in these techniques. Three lecture hours and three hours laboratory.

Prerequisite, Psych 835.

Credit, 4. Mr. Cashdan.

840. SEMINAR IN CLINICAL
PRACTICE.

A topic concerned with the practice of clinical psychology.

Credit, 2. Staff.

841. SEMINAR IN PERSONALITY.

A topic concerned with the area of personality.

Credit, 2. Staff.

842. SEMINAR IN CLINICAL
RESEARCH.

A topic concerned with research in clinical psychology.

Credit, 2. Staff.

843. SEMINAR IN CLINICAL
SPECIALTY.

A topic concerned with a specialty area within clinical psychology.

Credit, 2. Staff.

853. SEMINAR IN QUANTITATIVE
THEORIES OF BEHAVIOR.

Examination and evaluation of quantitative theories of selected behavioral phenomena. Topics selected from choice, detection and recognition, judgment, memory, learning, and concept formation.

Prerequisite, Psych 746 or permission of instructor. May be repeated for credit.

Credit, 1-9. Staff.

860. BASIC CONCEPTS IN
COUNSELING PSYCHOLOGY.

Introductory review and analysis of the psychological literature related to the practice, research and training functions in counseling psychology.

Prerequisite, 18 credits of psychology or permission of instructor.

Credit, 3. Mrs. Appley.

865. COUNSELING THEORIES
AND TECHNIQUES.

Detailed consideration of current theories and techniques employed in counseling psychology.

Prerequisites, Psych 270, 311 or permission of instructor.

Credit, 3. Staff.

866. THE PSYCHOLOGY OF
VOCATIONAL DEVELOPMENT.

Review and analysis of the psychological literature concerning the psychological basis for vocational choice.

Prerequisite, Psych 834 or equivalent.

Credit, 3. Staff.

868. GROUP COUNSELING AND
PSYCHOTHERAPY.

Review and analysis of the psychological literature in conjunction with experience in multiple counseling and therapeutic processes.

Two class hours, one 2-hour laboratory period.

Prerequisite, Psych 835 or 865 or equivalent.

Credit, 3. Staff.

871, 872. PRACTICUM.

Practice in the application of psychological techniques to clinical, and counseling, and practice in teaching in any area of psychology. Either semester may be elected independently.

Credit, 3-12. Staff, with the staffs of cooperating institutions and agencies.

873, 874. TEACHING PRACTICUM
IN PSYCHOLOGY.

Required of all doctoral candidates. Experience in procedures, leading discussion groups and teaching labs. Close supervision by members of the faculty. Students meet once a week to discuss problems in teaching.

Credit, 3-12. Staff.

891, 892. SEMINAR.

Selected topics of current significance in

psychology. Research studies analyzed and theoretical advances explored. Either semester may be elected independently. Both may be taken only with a change in topic. Prerequisite, permission of instructor.

Credit, 2 each semester.

Maximum credit, 6. Staff.

895, 896. RESEARCH METHOD-
OLOGY.

Study and evaluation of research methods and of problems in the major fields of psychology.

Credit, 2 each semester. Staff.

900. DOCTORAL DISSERTATION.

Credit, 30.

COURSES OPEN TO BOTH GRADUATE
AND UNDERGRADUATE STUDENTS.

(For either major or minor credit)

542 (II). ADVANCED EXPERI-
MENTAL PSYCHOLOGY.

Literature, techniques, and apparatus of experimental psychology. Selected projects carried out by individual students.

One class hour, two 2-hour laboratory periods.

Prerequisites, Psych 141.

Credit, 3. Mr. Dzendolet.

545 (I). STATISTICAL INFERENCE
IN PSYCHOLOGY.

Application of statistical procedures to analysis of psychological data and to problems of measurement in psychology and related fields.

Two class hours, one 2-hour laboratory period.

Prerequisites, Psych 101, Psych 145, or Stat 121.

Credit, 3. Mr. Myers, Mr. Pollatsek.

550 (I) (II). PHYSIOLOGICAL
PSYCHOLOGY.

Neural bases of behavior, current issues in physiological psychology; psychobiological investigations of learning, sensory processes, motivation, and instinctive behavior.

Three class hours.

Prerequisites, Psych 101 and Zool 101 or permission of instructor.

Credit, 3. Mr. Carlson, Mr. Trowill.

551 (I). LABORATORY IN PHYSI-
OLOGICAL PSYCHOLOGY.

Development of skills in laboratory tech-

niques used in physiological psychology, including animal neurosurgery, electrophysiological stimulation and recording, and assessment of drug-behavior interactions.
Two 2-hour laboratory periods.
Prerequisites, Psych 141 and 250.

Credit, 2. Staff.

563 (II). PSYCHOLOGY OF ADOLESCENCE (D).

The development, and emotional, social and intellectual adjustment of the individual during the adolescent years.
Three class hours.
Prerequisite, Psych 101.
Credit, 3. Mr. Schumer, Mr. Willoughby.

590 (I). INDUSTRIAL PSYCHOLOGY.

Psychological principles, underlying personnel selection and training, communication and decision-making in industry.
Three class hours.
Prerequisite, Psych 101.
Credit, 3. Mr. Moss.

611 (I). PSYCHOLOGICAL TESTS.

Survey of tests of intelligence, aptitude, interest, personality, and adjustment. Test rationale, construction, characteristics, uses and evaluation emphasized.
Two class hours, one 2-hour laboratory period.
Prerequisite, Psych 101.
Credit, 3. Mr. Schumer.

COURSES NOT FOR MAJOR CREDIT
(No graduate credit for students majoring in Psychology)

510 (I) (II). SENSATION AND PERCEPTION (D).

Methods, data and theories of the functioning of various sensory systems. Topics include a survey of basic sensory processes in the cutaneous senses, audition, vision, gustation, and olfaction; and higher perceptual processes in selected senses.
Three class hours.
Prerequisite, Psych 101.
Credit, 3. Mr. Danielson, Mr. Dzenolet.

511 (II.) LABORATORY IN SENSATION AND PERCEPTION.

Selected laboratory exercises in audition

and vision and a semester project chosen by the student, with the aid of the instructor, in some area of sensation or perception.
Two 2-hour laboratory periods.
Prerequisites, Psych 141 and 210.
Credit, 2. Mr. Danielson, Mr. Dzenolet.

520 (I) (II). LEARNING AND THINKING (D).

A general survey of animal and human learning and performance. Topics include: factors affecting acquisition, generalization, discrimination, extinction, and transfer in animals and humans; memory; and higher cognitive processes in humans.
Three class hours.
Prerequisite, Psych 101. *Credit, 3. Staff.*

521 (I.) LABORATORY IN HUMAN LEARNING.

Introduction to methods used in investigating rote verbal learning, concept formation, short-term retention, verbal conditioning, artificial language learning, motor-skills, and other phenomena in human learning and retention.
Two 2-hour laboratory periods.
Prerequisites, Psych 141 and 220.
Credit, 2. Mr. Chumbley, Mr. Clifton.

522 (II). LABORATORY IN ANIMAL LEARNING.

Introduction to methods used in investigating classical conditioning and operant behavior primarily using laboratory animals as subjects. Topics include: acquisition, generalization, discrimination, extinction, and transfer phenomena.
Two 2-hour laboratory periods.
Prerequisites, Psych 141 and 220.
Credit, 2. Mr. Ayres, Mr. Kamil, Mr. Moore.

531 (II). LABORATORY IN MOTIVATION.

Methods of investigating motivation, including both laboratory and field studies using human and animal subjects. Includes selected projects conducted individually and in small groups.
Two 2-hour laboratory periods.
Prerequisites, Psych 141, 230.
Credit, 2. Mr. Trowill.

560 (I). CHILD BEHAVIOR AND DEVELOPMENT.

Psychological development of the child, including theories, methods, and data of child behavior studies.

Three class hours.

Prerequisite, Psych 101. *Credit, 3. Staff.*

561 (II). LABORATORY IN CHILD BEHAVIOR AND DEVELOPMENT.

Selected experiments investigating perceptual, conceptual, learning, and social processes in children.

Two 2-hour laboratory periods.

Prerequisites, Psych 141 and 260.

Credit, 2. Mrs. Clifton, Mrs. Myers.

562 (I). CHILD PSYCHOLOGY (D).

Psychological development of the child, including language, emotions, intelligence, social behavior, motivation, and personality. Not open to psychology majors.

Three class hours.

Prerequisite, Psych 101. *Credit, 3. Staff.*

565 (I). INTRODUCTION TO THE STUDY OF EXCEPTIONAL CHILDREN.

Emphasis on the etiology, diagnosis, characteristics, education, and prognosis of deviations in mental, physical, and socio-emotional development.

Three class hours.

Prerequisites, Psych 101; 262; or permission of instructor. *Credit, 3. Mr. Raush.*

570 (I) (II). PERSONALITY (D).

Introduction to the scientific study of personality. Personality development, structure and dynamics from major theoretical orientations.

Three class hours.

Prerequisite, Psych 101.

Credit, 3. Mr. Watt, Mr. Kates

571 (II). EXPERIMENTAL STUDY OF PERSONALITY.

Review and evaluation of research approaches to the study of personality. Data,

theories, and methods of investigation. Selected projects carried out.

Two 2-hour laboratory periods.

Prerequisites, Psych 141 and 270.

Credit, 2. Mr. Epstein.

580 (I). SOCIAL PSYCHOLOGY (D).

Introduction to the principles and study of social behavior. The psychological factors involved in attitude formation and change, communication and persuasion, and small group processes.

Three class hours.

Prerequisites, Psych 101. *Credit, 3. Staff.*

581 (I). LABORATORY IN ATTITUDES AND OPINIONS.

Methods and research concerning attitude formation and change, attitude and opinion measurement, communication and persuasion.

Two 2-hour laboratory periods.

Prerequisites, Psych 141 and 280, or permission of instructor. *Credit, 2. Staff.*

582 (II). LABORATORY IN GROUP BEHAVIOR.

Methods and research concerning the behavior of individuals in groups. Interpersonal attraction, social interaction and influence, power and conflict, communication, group structure, leadership, and productivity. Two 2-hour laboratory periods.

Prerequisites, Psych 141 and 280, or permission of instructor.

Credit, 2. Mr. Steiner.

601 (I) (II). EDUCATIONAL PSYCHOLOGY.

Psychological facts and principles of development, learning, and measurement as applied to educational situations.

Two class hours, one 2-hour laboratory period.

Prerequisite, Psych 101.

Credit, 3. Mr. Schumer.

605 (II). HISTORICAL AND TEMPORARY SYSTEMS (D).

General structure of psychological theory; analysis and comparison of historical sys-

tems in the tradition of British empiricism-associationism and Continental rationalism, and of derivative near-contemporary and contemporary mentalistic, functionalistic, and behavioristic systems.

Three class hours.

Prerequisite, Psych 101.

Credit, 3. Mr. Ayres, Mr. Feldman.

625 (I). ABNORMAL PSYCHOLOGY (D).

Etiology, symptoms and therapy of behavior abnormalities including neuroses, psychoses, epilepsies, speech disorders, and mental deficiency. Hospital trips and clinics. Three class hours.

Prerequisite, Psych 101.

Credit, 3. Mr. Harmatz, Mr. Cashdan.

631 (II). CLINICAL PSYCHOLOGY.

Introduction to the theoretical approach and methods used in understanding and treating the psychologically-disturbed individual. Two class hours, one 2-hour laboratory period.

Prerequisite, Psych 325 or permission of instructor.

Credit, 3. Mr. Epstein, Mr. Kates.

665 (II). THEORIES AND PRACTICE IN COUNSELING.

Theories, techniques and tests necessary in counseling and guidance. Practice in organization and evaluating relevant data in the analysis of illustrative cases.

Two class hours, one 2-hour laboratory period.

Prerequisite, Psych 270, or 311, or permission of instructor. *Credit, 3.* Mr. Turner.

RELATED COURSES IN SOCIOLOGY:

729. SOCIOLOGY OF SMALL GROUPS.

784. ADVANCED SOCIOLOGICAL THEORY.

785. COMPLEX ORGANIZATIONS.

797. SURVEY DESIGN AND ANALYSIS.

Public Health

GRADUATE FACULTY

William A. Darity, *Head of the Department and Professor of Public Health*, B.S., Shaw University, 1948; M.S.P.H., North Carolina Central University, 1949; Ph.D., University of North Carolina at Chapel Hill, 1964.

Bernard B. Berger, *Professor of Public Health*, B.S., Massachusetts Institute of Technology, 1935; M.S., Harvard University, 1948.

Robert W. Gage, *Professor of Public Health*, B.S., Massachusetts, 1938; M.D., Harvard, 1942.

Warren Litsky, *Commonwealth Professor of Environmental Sciences and Director, Institute of Agricultural and Industrial Microbiology*; B.A., Clark, 1945; M.S., Massachusetts, 1948; Ph.D. Michigan State University, 1951.

A. Taher Moustafa, *Associate Professor of Public Health*, M.D., Cairo University, 1954; M.P.H., University of Alexandria, 1959; Dr. P.H., University of California at Berkeley, 1962.

Howard A. Peters, *Assistant Professor of Public Health*, B.A., University of Omaha, 1951; M.P.H., University of North Carolina at Chapel Hill, 1958; Ph.D., 1965.

Jerome S. Peterson, *Adjunct Professor of Public Health*, B.S., Syracuse, 1925; M.D., College of Physicians and Surgeons, Columbia, 1931; M.P.H., Harvard School of Public Health, 1939.

Donald Read, *Assistant Professor of Public Health*, A.B., Colorado State College 1960; M.A., Maryland, 1963; Ed.D., Boston University, 1968.

H. Jean Thiebaut, *Assistant Professor of Public Health*, B.A., Reed College, 1957; M.A., University of Oregon, 1960; Ph.D., Stanford, 1964.

Robert W. Tuthill, *Assistant Professor of Public Health*, B.A., University of Massachusetts, 1956; M.A., University of Pennsylvania, 1961; Ph.D., University of North Carolina at Chapel Hill, 1970.

Students interested in obtaining preparation in the various areas of Public Health, as well as pursuing investigation of public health problems will be accepted in the Department of Public Health if their previous academic background indicates an aptitude for graduate study. Applicants must satisfy the entrance requirements of the Graduate School. Usually applicants will be best prepared by having completed an undergraduate major in the physical sciences, biological sciences, public health, or the social and/or behavioral sciences. For all students some background study in both the social and behavioral sciences and the biological sciences is desirable. In special circumstances, acceptance may be granted with other undergraduate major concentration. The Department of Public Health is organized to offer a concentration of study in the following specialized areas:

- 1) Administration of Health Services.
- 2) Community Health Education.
- 3) Environmental Health.
- 4) Epidemiology and Biostatistics.
- 5) Public Health Laboratory.
- 6) Air Pollution.

The course of study leads to the Master of Science degree. Students will also be prepared for advanced graduate studies. The department encourages an interdisciplinary approach in academic and research pursuits and will arrange a cooperative program with other departments when this is in the interest of the student. Students who have completed undergraduate study in public health or have followed courses similar or parallel to the Public Health 500-600 series will not be permitted to take such courses for graduate credit.

Also, students who have deficiencies in certain specific, essential, undergraduate courses will be required to take such courses without graduate credit.

Each applicant's situation is handled on an individual basis.

More detailed information about specialized areas of study is available through the department. Interested persons may secure this information by writing to the department.

RESEARCH

All graduate students in the Department of Public Health must carry out some form of investigation or research as a requirement of the Master of Science degree. This will be conducted either in the form of a thesis or a special problem under the direction of a departmental faculty member who is a member of the Graduate Faculty. Before receiving the Master of Science degree, all students must pass an oral comprehensive examination. This examination will be given by at least three members of the Graduate Faculty. When the student elects to pursue a special problem instead of a thesis, a written comprehensive examination is required in addition to the oral comprehensive examination. Comprehensive oral and comprehensive written examinations will cover the research project as well as the subject matter the student will have taken leading up to the Master of Science degree.

The following courses, with some minor adjustments, are required of all Public Health majors:

COURSES REQUIRED OF ALL STUDENTS FOR MASTER OF SCIENCE DEGREE

- | | |
|---|---------------------------------|
| PH 683. Introduction to Public Health Practice. | <i>Credit, 4.</i> |
| PH 661. Environmental Health. | <i>Credit, 3.</i> |
| PH 678. Epidemiology | <i>Credit, 3.</i> |
| PH 675. Public Health Statistics. | <i>Credit, 3.</i> |
| PH 776. Evaluation of Public Health Research | <i>Credit, 3.</i> |
| PH 795 and 796. Seminar. | <i>Credit, 1 each semester.</i> |

PH 700. Special Problems. *Credit, 1-6.*
or
PH 800. Master's Thesis. *Credit, 6-10.*

Courses to fulfill requirements for concentration in the area of public health elected by the student (administration of health services, community health education, environmental health, epidemiology and biostatistics, or public health laboratory) will be selected in cooperation with his faculty adviser. The total program and the topic for investigation or research must have approval of the Department's Graduate Coordination Committee. Two academic years is the normal period required for satisfying requirements for the Master of Science degree in the Department of Public Health.

MASTER OF ARTS IN TEACHING (MAT) IN PUBLIC HEALTH

The Master of Arts in Teaching Degree (MAT) is offered in cooperation with the School of Education to candidates who are interested in health education teaching at the secondary and elementary school level. The degree is also offered to candidates interested in general health teaching and health technology teaching (Medical Technology, Environmental Health, etc.) at the Community College level.

Both programs require 36 graduate credits, distributed as follows:

Education courses 6 credits
Education practicum 6 credits

At least 12 credits in Public Health, to include at least two courses and two seminars.

The remaining credits (at least 12) will be taken in the Department of Public Health or must be courses approved by the Department of Public Health.

Prerequisites for admission are:

a.) For all candidates, a bachelors degree in an appropriate discipline or equivalency.

b.) For Medical Technology candidates, the MT (ASCP) certification and at least one one year experience on a professional level, or its equivalency.

Applicants interested in the MAT in Public Health should apply to the School of Education but indicate *Public Health* as their major interest on their application.

COURSES OPEN TO GRADUATE STUDENTS ONLY

700. SPECIAL PROBLEMS IN PUBLIC HEALTH.

Special investigational or research problems in public health for advanced students. The scope of the work can be varied to meet specific conditions. *Credit, 3-6. Staff.*

701. PUBLIC HEALTH LAW.

Constitutional and social bases for public health laws. The development of statutes and regulations and their effects on social problems, including review of court decisions and the preparation of administrative regulations.

Credit, 3. Mr. Hartzler.

702. ADVANCED METHODS IN HEALTH EDUCATION.

Health education efforts that have influenced community health. Individual study, programming and research methods. Prerequisite, permission of instructor.

Credit, 3. Mr. Darity.

703. PLANNING OF ENVIRONMENTAL HEALTH PROGRAMS.

Principles of environmental health as translated into community programs planned to meet desirable objectives. Studies of different surveys and rating systems as measuring devices for the effectiveness of programs.

Prerequisite, PH 661 or equivalent.

Credit, 3. Mr. Peters.

706. ADVANCED EPIDEMIOLOGY.

Lectures and discussions on the principles and methods of epidemiological investigation; laboratory work includes assembling and analyzing crude data resulting from field investigations.

Prerequisite, Ph 672. *Credit, 3. Staff.*

776. EVALUATION OF PUBLIC
HEALTH RESEARCH.

Principles of statistics applied to the evaluation of public health research.

Credit, 3. Mrs. Thiebaut.

782. SUPERVISED FIELD TRAIN-
ING (INTERNSHIP).

For students majoring in public health. Opportunity for supervised field observation and professional experience in selected public health agencies. Assignments in either associate functions or internships. Departmental staff; consultants in public health agencies.

Credit, 3-12. Staff.

795, 796. SEMINAR.

Lectures and reports on current literature and special topics. *Credit, 1 each semester.*

Maximum credit, 4. Mr. Berger.

800. MASTER'S THESIS.

Independent research leading to the preparation of a thesis on a public health subject. Results should be suitable for publication.

Credit, 3-10. Staff.

COURSES OPEN TO BOTH GRADUATE
AND UNDERGRADUATE STUDENTS

563. INSTITUTIONAL HYGIENE
AND SANITATION.

Practices and principles of industrial processes involved in industrial health and quality control.

Credit, 3. Mr. Wisniewski.

564. MICROSCOPY OF WATER.

Microscopic forms of life, exclusive of bacteria. Counting and control of plankton in potable waters. Elements of limnology. 3 class hours, one 2-hour laboratory period.

Credit, 3. Mr. Wisniewski.

601. PRINCIPLES OF COMMUNITY
HEALTH PROGRAM.

Principles of health education. Exploration of methods and approaches to community health. Family, school, and community dimensions and potentials. Types and use of various methods leading to community action.

3 class hours, one 2-hour laboratory period.

Prerequisite, permission of instructor.

Credit, 4. Mr. Darity.

602. COMMUNITY DEVELOPMENT
IN HEALTH EDUCATION.

Latest approaches in community development and community organization procedures. Exploratory readings, field assignments, and leadership emphasis; emphasis on coordinated community action.

Prerequisite, permission of instructor.

Credit, 3. Mr. Darity.

604. SCHOOL HEALTH.

Consideration of the principles concepts, methods, and dynamics of the organization of a school health program at the elementary and secondary level. Stress is placed in the planning and teaching in problem areas, (i.e., sex education, mental health and drugs).

Prerequisite, junior or senior standing or permission of instructor. *Credit, 3.* Mr. Read.

605. CURRENT ISSUES IN HEALTH
EDUCATION.

Latest issues in the field of health. Emphasis on controversial issues such as sex, drugs, and suicide education.

Credit, 3. Mr. Read.

611. HUMAN SEXUALITY AND SEX
EDUCATION.

Promotes insight into human sexuality in relation to modern life. Primary emphasis on human sexuality as it may appear in the infant, the child, the adolescent, and the young married adult, as well as an examination and clarification of some of the crucial dynamics of the present era.

Prerequisite, permission of instructor. (P/F only)

Credit, 3. Mr. Read.

612. PUBLIC HEALTH AND
FAMILY PLANNING.

Public Health problems associated with family health and population limitation. Historical factors, limitation methods, and barriers and facilitators related to family health and size.

Prerequisites, PH 123, Sociology 101, or permission of instructor.

Credit, 3. Mr. Darity.

631. INTRODUCTION TO OCCUPATIONAL HEALTH.

The relation of the occupational environment of health, efficiency, and well-being of workers.

Prerequisites, Math 112, Chem 160, Zool 135, or permission of instructor.

Credit, 3. Mr. Peters.

632. INTRODUCTION TO AIR POLLUTION.

Effects of atmospheric air contamination on man and his environment. Nature and behavior of particulate and gaseous components of air, sources and control of pollutants, atmospheric sampling and analysis, biological effects, air quality standards. Prerequisites, Math 112, Chem 160, Zool 135, or permission of instructor.

Credit, 3. Mr. Peters.

637. INTRODUCTION TO RADIATION PROTECTION.

Effect and control of radiation in the mammalian system. Includes sources, measurements, radio-sensitivity, radiation chemistry, cellular effects and acute and delayed effects in occupational, medical, and environmental exposures.

Prerequisite, permission of instructor.

Credit, 3. Staff.

661 (I), 662 (II). ENVIRONMENTAL HEALTH.

The application of scientific knowledge to the control of man's environment. Air, water, waste disposal, food, housing, vector control, accidents, heat, light, noise, and ionizing radiation are considered.

Prerequisites, Chem 127, Chem 160, Microbiology 250, Phys 142, or permission of instructor.

Credit, 3. Mr. Peters.

672. EPIDEMIOLOGICAL METHODS.

Methods and problems in descriptive, analytic, and experimental epidemiology. Socioeconomic and biological elements in communicable and chronic diseases, in accidents, and in health of human populations. Two class hours, two 2-hour laboratory periods.

Prerequisites, Stat 121 or equivalent, PH 378, or permission of instructor.

Credit, 4. Mr. Tuthill.

674. CLINICAL BACTERIOLOGY.

Procedures in clinical laboratory work. One class hour, two 2-hour laboratory periods. Prerequisites, Microbiol 250 or permission of instructor.

Credit, 3.

675. PUBLIC HEALTH STATISTICS.

Principles of statistics applied to the evaluation of public health practices.

Three class hours, one 2-hour laboratory period.

Prerequisites, permission of instructor.

Credit, 3. Mrs. Thiebaut.

678. EPIDEMIOLOGY.

Principles of communicable and chronic disease causation, accident prevention and other causation factors, grouped and analyzed according to common variable.

Prerequisite, permission of instructor.

Credit, 3. Mr. Tuthill.

679. BASIC PUBLIC HEALTH LABORATORY PROCEDURES.

Standard methods used in present day applied bacteriology; soils, dairy products, water and shellfish, and air.

Two class hours, two 2-hour laboratory period.

Prerequisite, Microbiology 140 or permission of instructor.

Credit, 3. Mr. Litsky.

680. ADVANCED PUBLIC HEALTH LABORATORY PROCEDURES.

Public health laboratory procedures; field collection of samples, stream pollution study, food poisoning and infection, standard methods of food analysis.

One 4-hour and one 2-hour laboratory period. Prerequisite, 679 or permission of instructor.

Credit, 3. Mr. Litsky.

683. INTRODUCTION TO PUBLIC HEALTH PRACTICE.

Introduction to the philosophy, nature, and scope of modern public health practice.

Prerequisites, Soc 101 and Zoology 101, or permission of instructor.

Credit, 4. Mr. Moustafa.

684. ORGANIZATION AND ADMINISTRATION OF PUBLIC HEALTH PROGRAMS.

The organization of public health programs and the requisite functional administrative structure. This course includes planning and evaluation procedures.

Prerequisites, Soc 101 and Zoology 101, or permission of instructor.

Credit, 4. Mr. Moustafa.

(PARTIAL LIST OF COURSES IN OTHER SCHOOLS AND DEPARTMENTS FOR WHICH MAJOR CREDIT WILL BE GIVEN IN THE DEPARTMENT OF PUBLIC HEALTH).

Bus Ad 742. Organizing for Production.

Bus Ad 751. Principles and Policies of Administration.

Bus Ad 752. Administrative Practices.

Econ 562. American Economic History.

Econ 566. Economic Development.

Econ 571. Comparative Economic Systems.

Econ 582. Urban Economics.

Econ 641. Economic Security.

Chem 523, 524. General Biochemistry.

Chem Eng 660. Air Pollution (Control) Processes.

Civ Eng 571. Principles of Environmental Engineering.

Civ Eng 672. Waste and Wastewater Analysis.

Civ Eng 674. Radiological Health Engineering.

Civ Eng 675. Surface Water Quality Control.

Educ 881. Comparative Education.

Microbiol. 580. Pathogenic Bacteriology.

Microbiol. 610. Immunology.

Microbiol. 620. Virology.

Microbiol. 710. Advanced Immunology.

Psych 545. Statistical Inference in Psychology.

Psych 580. Social Psychology.

Psych 601. Educational Psychology.

Psych 780. Advanced Social Psychology.

Sociol 547. Elementary Statistics.

Sociol 551. Urban Sociology.

Sociol 561. Population Problems.

Sociol 587. Sociology of Mental Disorders.

Sociol 722. Sociology of Education.

Sociol 731. Social Gerontology.

Sociol 732. Sociology of Medicine.

Sociol 757. Seminar in the Family.

Sociol 763. Fertility and Society.

Sociol 764. Population Characteristics and Socio-Economic Change.

Sociol 765. Techniques of Demographic Analysis.

Sociol 766. Human Ecology.

Stat 531, 532. Introduction to Fundamentals of Statistical Inference (I) (II).

Stat 551. Elementary Statistics.

Stat 561. Design of Experiments (Theory).

Stat 571. Survey Sampling.

Stat 581. More Prevalent Analysis Methods.

Regional Planning

(See also Landscape Architecture)

GRADUATE FACULTY

Ervin H. Zube, *Chairman of Program, Professor of Landscape Architecture, and Head of Department*, B.S., Wisconsin, 1954; M.L.A., Harvard, 1959; F.A.A.R., American Academy in Rome, 1961.

Theodore S. Bacon, Jr., *Professor of Planning*, B.A., Amherst, 1942; M.C.P., Massachusetts Institute of Technology, 1956.

Carl A. Carlozzi, *Associate Professor of Resource Planning*, B.S., Kent State, 1955; M.A., 1957; Ph.D., Michigan, 1965.

Julius Gy Fabos, *Associate Professor of Landscape Architecture*, B.S., Rutgers, 1961; M.L.A., Harvard, 1964.

John H. Foster, *Professor of Agricultural Economics*, B.S., Cornell, 1950; M.S., Purdue, 1951; Ph.D., Cornell, 1957.

Barrie Greenbie, *Associate Professor of Regional Planning*, B.S., Florida, 1953; M.S., Wisconsin, 1968.

Benjamin Isgur, *Adjunct Professor of Resource Planning*, B.S., Massachusetts, 1933; M.S., 1935; Ph.D., 1940.

Andrew J. W. Scheffey, *Professor of Regional Planning*, B.A., Haverford, 1951; M.S., Michigan, 1952; Ph.D., 1958.

REGIONAL PLANNING ADVISORY COMMITTEE

Ervin H. Zube, *Chairman*.

Theodore S. Bacon, Jr., *Professor of Planning*.

Bernard B. Berger, *Professor of Public Health and Director, Water Resources Research Center*.

Terrence Burke, *Associate Professor of Geography*.

Carl A. Carlozzi, *Associate Professor of Resource Planning*.

Julius Gy Fabos, *Associate Professor of Landscape Architecture*.

John H. Foster, *Professor of Agricultural and Food Economics*.

William E. Randall, Jr., *Professor of Recreation and Head of the Department*.

Robert L. Rivers, *Associate Professor of Transportation and Finance*.

MASTER OF REGIONAL PLANNING

The degree is conferred upon graduate students who have satisfactorily met the following requirements:

UNIVERSITY OF MASSACHUSETTS

1. Work covering at least two years in residence and a minimum internship in a public or private office of at least three months. Specific requirements of such practice are determined by the planning staff.

2. The earning of not fewer than 46 credits of which 28 shall consist of graduate level courses within the department, with specific deviations at the discretion of the department.

3. Preparation of a satisfactory thesis or terminal project.

4. The passing of a final examination, written and/or oral.

5. Payment of all fees and expenses before the degree is conferred.

6. Recommendation by the Department of Landscape Architecture to the Graduate School for the awarding of the degree and approval of the recommendation by the Dean of the Graduate School.

COURSES OPEN TO GRADUATE STUDENTS ONLY

700. SPECIAL PROBLEMS. *Credit, 1-5.*

703. LAND AND THE DEVELOPMENT OF COMMUNITIES.

Land and its use from ancient to modern times. Emphasis on the resource base and its importance as the intensity of land use increases in the development of both rural communities and highly urbanized areas.

Credit, 3.

704 METROPOLITAN AND REGIONAL PLANNING.

The growth and decentralization of cities and the formation of metropolitan areas. Planning as applied to the metropolitan complex and for various types of regions.

Credit, 3.

791. REGIONAL PLANNING STUDIO.

Preparation of regional development plans based upon an interdisciplinary approach to the analysis and evaluation of regional problems and potentials.

Credit, 5.

793, 794. SEMINAR.

Credit, 2 each semester.

800. MASTER'S THESIS. *Credit, 8.*

801. TERMINAL PROJECT. *Credit, 8.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

545. METROPOLITAN TRANSPORTATION.

The analysis of economic, social and technological developments on demand and supply factors for the movement of people and goods within urban areas. Determination of the optimal mix of modal facilities to maximize the total transport resources of the urban area. Attention to the coordination of internal and external transport systems. Prerequisite, permission of instructor. (Same as Bus Ad 545) *Credit, 3.*

573, 574. CITY PLANNING.

The historical and legal aspects of land use and regional development, and a critical examination of planning techniques used in guiding the physical growth of communities. *Credit, 3 each semester.*

602. ECOLOGICAL PRINCIPLES OF RESOURCE PLANNING.

Analysis of ecological principles and their relationship and importance to resource planning. State and Federal conservation programs chosen for critical case study. Prerequisite, permission of instructor. (Same as Forestry 602) *Credit, 3.*

675, 676. PROJECTS IN PLANNING.

Application of the principles of modern civic development through a series of problems on the design of various types of land areas. *Credit, 3 each semester.*

677, 678. URBAN PROBLEMS.

Housing, industrial location and development, decentralization, arterial systems, civic and metropolitan design, and regional planning. *Credit, 2 each semester.*

Slavic Languages and Literature

GRADUATE FACULTY

Maurice I. Levin, *Head of the Department and Associate Professor of Slavic*

Languages, A.B., Boston University, 1953; A.M., Harvard, 1958; Ph.D., 1964. George Ivask, *Professor of Slavic Languages*, Ph.D., Harvard, 1955.

Aron Pressman, *Professor of Slavic Languages*, M.A., Tiflis Conservatory, 1918. Laszlo M. Tikos, *Associate Professor of Slavic Languages*, M.A., University of Debrecen, Hungary, 1954; Ph.D., University of Tübingen, Germany, 1962.

Master of Arts

Prerequisites for admission: A bachelor's degree with a major in Russian language or an equivalent competency in Russian language and literature and indication of ability to do successful graduate work. Deficiencies in literary background and/or a command of spoken or written Russian must be made up before the candidate can be admitted to certain courses required for the degree.

Language: For this degree the student must have, or must acquire, a reading knowledge of at least one major language, modern or ancient, other than Russian or English, preferably French or German. In addition, the student will be required to demonstrate proficiency in speaking, understanding, reading and writing contemporary standard Russian.

Program of study: A total of 30 credits, at least half of which must be earned in courses open to graduate students only (700-900 series). The student will be required to pass a comprehensive written examination in order to demonstrate 1) proficiency in the language itself; 2) familiarity with the whole body of Russian literature; 3) thorough knowledge of the structure and history of the Russian language and of Old Church Slavic; 4) knowledge of Russian and Soviet history and culture.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. PROBLEMS COURSE.

Directed study in some special area of literature or linguistics. *Credit, 3-12.* Staff.

710. OLD CHURCH SLAVIC.

Introduction to the phonology, morphology and syntax of Old Church Slavic; selected readings and textual analysis. Required of all first-year graduate students.

Credit, 3. Mr. Lake.

770. PROSEMINAR I. BIBLIOGRAPHY AND METHODOLOGY.

An introduction to tools and methods of research. Designed to acquaint students with major reference works, scholarly publications, and basic approaches to literary criticism. Required of all candidates for graduate degree. Offered in the fall. *Credit, 3. Staff.*

770. PROSEMINAR II. and III. INTERPRETATION OF TEXTS.

Problems in philology or in literary interpretation. Reports and papers on selected texts. Prerequisite, Proseminar I.

Credit, 3 each semester. Staff.

780. SEMINAR.

Close study of a single topic, author or work. One main purpose is to suggest projects for independent research to advanced students. Subject matter varies from year to year.

Credit, 3-9. Staff.

782. TRANSLATION.

Written translation from Russian into English. Individual direction (no formal lectures).

Credit, 3. Staff.

800. MASTER'S THESIS. *Credit, 6-9.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS

(For either major or minor credit)

553. (I). DOSTOEVSKY.

Historical and literary background. Close text analysis. Student reports. Readings of selected works in the original required of Russian majors. *Credit, 3. Mr. Tikos.*

554 (II). TOLSTOY.

Historical and literary background. Close text analysis. Student reports. Readings of selected works in the original required of Russian majors. *Credit, 3. Mr. Tikos.*

556 (II). RUSSIAN DRAMA.

Drama in the originals from the beginning to the establishment of a national theatre culminating in plays of Ostrovsky, Chekhov, Gorky.

Prerequisite, proficiency in Russian.

Credit, 3. Staff.

557 (II). SOVIET LITERATURE.

The beginnings and development of Soviet prose, drama and criticism from Gorky to Sholokhov and Pasternak.

Prerequisite, proficiency in Russian.

Credit, 3. Mr. Tikos.

558 (II). RUSSIAN POETRY.

Russian poetry in the originals, from the early days of the 19th Century to the present with emphasis on the major poetic trends.

Prerequisite, proficiency in Russian.

Credit, 3. Mr. Ivask.

563 (II). THE HISTORY OF THE RUSSIAN LANGUAGE.

Historical development of the Russian language, its relation to other languages, changes in sound, form and vocabulary from the earliest period to the present.

Prerequisite, proficiency in Russian.

Credit, 3. Mr. Lake.

564 (II). SCIENTIFIC RUSSIAN.

Translating scientific, academic and journalistic articles.

Prerequisite, Russ 140 or equivalent.

Credit, 3. Mr. Stawiecki.

565 (I). STRUCTURE OF RUSSIAN.

Descriptive analysis of the morphology of contemporary standard Russian with additional emphasis on selected problems of derivation.

Prerequisite, proficiency in Russian.

Credit, 3. Mr. Levin.

566. RUSSIAN PHONETICS.

Detailed analysis of the Russian sound system. Articulation and intonation treated largely in comparison with the English sound system. Recommended for those preparing to teach Russian.

Prerequisite, Russ 262 or equivalent.

Credit, 3. Staff.

The Captain's Daughter, The Bronze Horseman, Poltava, and others. Facility in speaking and writing Russian required. Class conducted on a seminar basis with each student actively participating.

Credit, 3. Mr. Ivask.

620 (II). GOGOL.

The most important works of Gogol: *The Inspector-General, Dead Souls, The Overcoat* and selected passages from his *Correspondence with Friends*, and other works. Facility in speaking and writing Russian required. Class conducted on a seminar basis with each student actively participating.

Credit, 3. Mr. Ivask.

631 (II). NINETEENTH CENTURY
RUSSIAN CRITICISM.

Criticism of the 19th century: Belinsky, Chernyshevsky, Dobrolyubov, Pisarev and others. Facility in speaking and writing Russian required. Class conducted on a seminar basis with each student actively participating.

Credit, 3. Mr. Ivask.

RELATED COURSES IN
COMPARATIVE LITERATURE:

631. THE ENLIGHTENMENT.

641. ROMANTICISM.

642. FROM IDEALISM TO
REALISM.

651. SYMBOLISM.

652. MODERN DRAMA.

661. THE CONTEMPORARY
EUROPEAN NOVEL.

702. LITERARY CRITICISM.

704. CONTEMPORARY THEORIES
OF LITERATURE.

RELATED COURSES IN
LINGUISTICS:

501. GENERAL LINGUISTICS.

709. MATHEMATICAL
LINGUISTICS.

713. LINGUISTICS AND
LITERATURE.

619 (I). PUSHKIN.

The most important works of Pushkin, prose and poetry: *Eugene Onegin, Boris Godunov*,

COURSES NOT FOR
MAJOR CREDIT

419, 429, 439. RUSSIAN READING
COURSE.

Intensive study of Russian grammar. Emphasis on developing reading ability only. Appropriate for graduate students preparing for their reading examinations.

No credit.

Sociology

GRADUATE FACULTY

Thomas O. Wilkinson, *Head of the Department and Professor of Sociology*, B.A., North Carolina, 1945; M.A., Duke, 1950; Ph.D., Columbia, 1957.

Albert Chevan, *Assistant Professor of Sociology*, B.S., Cornell, 1953; M.S., Connecticut, 1957; Ph.D., University of Pennsylvania, 1968.

Roland J. Chilton, *Associate Professor of Sociology*, B.A., Monmouth, 1951; M.A., Wisconsin, 1958; Ph.D., Indiana, 1962.

Edwin D. Driver, *Professor of Sociology*, B.A., Temple, 1945; M.A., University of Pennsylvania, 1947; Ph.D., 1956.

Hilda H. Golden, *Associate Professor of Sociology*, A.B., Skidmore, 1942; A.M., Duke, 1944; Ph.D., 1950.

Milton M. Gordon, *Professor of Sociology*, A.B., Bowdoin, 1939; M.A., Columbia, 1940; Ph.D., 1950.

John P. Hewitt, *Assistant Professor of Sociology*, B.A., State University of New York at Buffalo, 1963; M.A., Princeton, 1965; Ph.D., 1966.

Paul Hollander, *Associate Professor of Sociology*, B.A., University of London, 1959; M.A., University of Illinois, 1960; A.M., Princeton, 1962; Ph.D., 1963.

Lewis M. Killiam, *Professor of Sociology*, A.B., University of Georgia, 1940; M.A., 1941; Ph.D., Chicago, 1949.

J. Henry Korson, *Professor of Sociology*, B.A., Villanova, 1931; M.A., Yale, 1942; Ph.D., 1947.

Michael Lewis, *Associate Professor of Sociology*, A.B., Brooklyn College, 1959; M.A., Princeton, 1962; Ph.D., 1967.

John W. Loy, Jr., *Associate Professor of Physical Education*, B.S., Lewis and Clark College, 1961; M.A., Iowa, 1963; Ph.D., Wisconsin, 1967.

John F. Manfredi, *Associate Professor of Sociology*, B.A., University of Pennsylvania, 1942; M.A., Harvard, 1948; Ph.D., 1951.

Surinder K. Mehta, *Associate Professor of Sociology*, B.A., Oregon, 1952; M.A., 1955; Ph.D., Chicago, 1959.

John F. O'Rourke, *Assistant Professor of Sociology*, A.B., Massachusetts, 1956; Ph.D., Yale, 1963.

Charles H. Page, *Professor of Sociology*, A.B., University of Illinois, 1931; Ph.D., Columbia, 1940.

Peter Park, *Associate Professor of Sociology*, B.A., Columbia, 1953; M.A., Yale, 1955; Ph.D., 1958.

Eugene B. Piedmont, *Associate Professor of Sociology*, B.S., State University of New York, 1956; M.A., Rochester, 1959; Ph.D., Buffalo, 1962.

Gerald M. Platt, *Associate Professor of Sociology*, B.A., Brooklyn College, 1955; M.A., 1957; Ph.D., University of California at Los Angeles, 1964.

Jon E. Simpson, *Associate Professor of Sociology*, B.A., Ohio Wesleyan, 1954; M.A., Ohio State, 1958; Ph.D., 1961.

Hans Speier, *Robert M. MacIver Professor of Sociology and Government*, Ph.D., University of Heidelberg, 1928.

Gordon F. Sutton, *Associate Professor of Sociology*, B.A., Wayne State, 1953; M.A., 1955; Ph.D., University of Michigan, 1959.

Curt Tausky, *Associate Professor of Sociology*, B.A., Portland State, 1959; Ph.D., Oregon, 1963.

William J. Wilson, *Associate Professor of Sociology*, B.A., Wilberforce, 1958; M.A., Bowling Green, 1961; Ph.D., Washington State, 1965.

David W. Yaukey, *Associate Professor of Sociology*, B.A., Oberlin, 1949; M.A., Washington State, 1950; Ph.D., University of Washington, 1956.

ASSOCIATED FIVE-COLLEGE GRADUATE FACULTY

Norman Birnbaum, *Professor of Sociology* (Amherst College), A.B., Williams, 1947; M.A., Harvard, 1951; M.A., Oxford, 1960; Ph.D., Harvard, 1958.

Ely Chinoy, *Mary Huggins Gamble Professor of Sociology and Anthropology* (Smith College), B.A., Newark, 1942; Ph.D., Columbia, 1953.

Peter I. Rose, *Professor of Sociology and Anthropology* (Smith College), A.B., Syracuse, 1954; M.A., Cornell, 1957; Ph.D., 1959.

Applicants for admission to graduate study in sociology are expected to be familiar with fundamental sociological concepts. Since this is neither assured nor precluded by particular undergraduate courses of study, the *Advanced Test in Sociology on the Graduate Record Examination* is required. Candidates may be asked to remove deficiencies, without receiving graduate credit, prior to or after admission.

Students working toward either the Master of Arts or Doctor of Philosophy degree in sociology must fulfill the general requirements of the Graduate School. Master's degree candidates must complete a minimum of 30 credits of work. Of these at least 24 credits must be for courses; at least six are awarded for successfully completing a thesis. Normally, *at least* one of the required eight courses shall be taken in sociological theory, *at least* one in research methods, and another in statistics. The thesis, followed by a final oral examination, is required of all terminal master's degree candidates, as well as of most doctoral candidates. There is no foreign language requirement for the Master of Arts degree.

The Doctor of Philosophy degree, while it has few specific course requirements, utilizes as its guiding principle the effective preparation of candidates to excel at two tasks: (1) the Comprehensive Examination and (2) the Dissertation. The Comprehensive Examination is both

written and oral. Since no relationship is assumed to obtain between specific courses taken and the high expectations of the Comprehensive Examination, course requirements are quite flexible. The exception is two graduate level statistics courses, both of which must be passed with a minimum grade of B. The written portion of the Comprehensive Examination covers two "special fields," selected by the student from areas of particular Departmental expertise, plus a required section on sociological theory and research methodology combined.

The Comprehensive Examination may not be taken until a minimum of 30 credits of course work has been completed *and* both the foreign language and statistics certification requirements fulfilled. Upon successfully passing the Comprehensive Examination, the student is admitted to candidacy for the Ph.D. degree and may proceed with the Dissertation. A public oral final examination, not necessarily limited to the dissertation, is also required.

Doctoral candidates must also demonstrate "intermediate level" competence, usually as tested by standardized examinations, in one language other than their native tongue. "Tool of research" options may not be substituted for this requirement. Students are strongly urged to take the foreign language examination as early in their program of studies as possible.

Applications for admission will *not* be evaluated until *all* credentials have been received. These include Graduate Record Examination scores (both Aptitude and Advanced), two letters of recommendation, and transcripts of all previous academic study. Students requesting any form of financial aid are responsible for seeing to it that all application material is on file in the Graduate School by February 15 (for Fall entrance) and October 1 (for Spring entrance).

Applications from countries whose native tongue is not English must, in addition, take the Test of English as a Foreign Language (TOEFL). The Graduate

School also requires all foreign students to take an English examination at the beginning of their initial semester, after admission. Remedial work may be prescribed on the basis of this examination.

COURSES OPEN TO GRADUATE STUDENTS ONLY

700. SPECIAL PROBLEM.

A special project in sociology.

Prerequisite, permission of instructor.

Credit, 3. Staff.

712. SOCIAL CHANGE.

Analysis of change as a process, especially the factors making for acceptance or rejection of innovations. Intrasocietal sources of change. Consequences of contacts between societies, with emphasis on underdeveloped areas.

Prerequisite, Soc 272 or permission of instructor.

Credit, 3.

714. CRIMINOLOGY.

Criminological theories, past and present with emphasis on present research trends as they relate to theoretical formulations.

Prerequisite, permission of instructor.

Credit, 3. Mr. Driver, Mr. Simpson.

717. JUVENILE DELINQUENCY.

Theories of causation and treatment of delinquency.

Prerequisite, Soc 278 or permission of instructor.

Credit, 3. Mr. Driver, Mr. Simpson.

718. INDUSTRIAL SOCIOLOGY.

The role, status, and function of the worker in the industrial community; the impact of technological change on the community; analysis of selected occupational functions.

Credit, 3. Mr. Tausky.

719. THE SOCIOLOGY OF RELIGION.

The relations of religious ideology and ecclesiastical organization to the total social institutional system. Attention to the religions of larger civilizations, especially Islam, Buddhism, Medieval Christianity, Gentile Paganism, Protestantism, and Judaism.

Credit, 3. Mr. Manfredi.

722. SOCIOLOGY OF EDUCATION.

Educational characteristics of an industrial

population; comparative social structures and their school systems; educational selection and social stratification; educational development as effect and cause of social change; the internal organization and culture of schools and universities.

Prerequisites, one graduate course in sociological theory and one course in research methods. *Credit, 3. Staff.*

729. SOCIOLOGY OF SMALL GROUPS.

Survey of sociological theory and research of small groups. Dynamics of leadership patterns, role theories, organization-disorganization theories, decision making, internal process and sociometric structuring. The relevance of small group theory and research to concepts of the inclusive social system.

Credit, 3. Mr. O'Rourke.

731. SOCIAL GERONTOLOGY.

Implications of aging for society and the individual. Position of the aged in non-industrial and industrialized societies. Changing roles of older people in the American family and the community.

Prerequisite, Soc 257 or permission of instructor. *Credit, 3. Mr. O'Rourke.*

732. SOCIOLOGY OF MEDICINE.

A survey of theory and research concerned with medical care as a social institution. The relation of social factors to illness, and social processes involved in medical education.

Prerequisite, Soc 286 or permission of instructor. *Credit, 3. Mr. Piedmont.*

733. POLITICAL SOCIOLOGY.

Analysis of the major topics and problems of political sociology in a comparative context. Special attention given to contemporary social movements, political pluralism and extremism, the social roots of totalitarian and democratic societies, and the interaction between the political and non-political institutions of society.

Credit, 3. Mr. Hollander.

735. SOCIAL MOVEMENTS.

Analysis of the genesis, career, values, norms, structure and end-products of social movements, including studies of selected movements. *Credit, 3. Mr. Killian.*

736. COLLECTIVE BEHAVIOR.

The processes of interaction through which new social norms and forms of social organization emerge in the crowd, the public and the social movement. Emphasis on principles of collective behavior as exemplified in the crowd, compact and diffuse.

Credit, 3. Mr. Killian.

737. SEMINAR ON PUBLIC POLICY AND SOCIAL SCIENCES.

The mobilization of the social sciences for the solution of domestic social problems. The concern is less with substantive issues and more with the strategy of applied social science in the context of social policy. Topics include: evaluation as research, values in pursuit of research, support of research and the 'knowledge for what' problem, and the relationship of science to planned social change.

Credit, 3. Mr. Sutton.

740. CRISIS RESOLUTION AND COMMUNICATION.

Discussion of relevant concepts. Case studies of international crises from 1947-1968 with attention to the calculations of decision makers. *Credit, 3. Mr. Speier.*

750. BLACK MAN IN AMERICA.

A socio-historical analysis of the interaction of the Black man and the American environment, beginning with his experiences with slavery, to his migration to urban areas and subsequent isolation in the black ghetto. The role of power in the nature of black-white relations. *Credit, 3. Mr. Wilson.*

757. SEMINAR IN THE FAMILY.

Cross-cultural examination of family systems: their development, factors influencing changes, and directions of changes. Comparison of theoretical frames of reference for theory construction and research: structural-functional, institutional, development, situational, and interactional. Review of methodological trends and developments: prediction studies, surveys, demographic analyses.

Prerequisite, Soc 257 or permission of instructor. *Credit, 3. Mr. Korson,*

Mr. Lewis, Mr. Piedmont.

758. FAMILY AND KINSHIP
COMPONENTS IN CONTEMPORARY SOCIAL PROBLEMS.

Relative importance of family and kinship in the analyses of contemporary sociologists; how this analysis informs inquiry into problems such as political and economic modernization, urbanization, stratification, the institutionalization of poverty, deviance, social control, and the community. Specific topics selected after consultation with students. *Credit, 3.* Mr. Lewis.

759. SOCIAL STRATIFICATION.

The major contemporary writers and their contribution to this area. Research techniques in the analysis of social class and social mobility are examined.

Prerequisite, Soc 259 or permission of instructor. *Credit, 3.* Mr. Gordon.

762. DEMOGRAPHY.

An analysis of the demographic transition from peasant-agriculturalism to urban industrialism. Emphasis on the consequences of this transition for patterns of settlement and for fertility, mortality, and migration. Special studies are made of the demographic characteristics of non-industrialized nations as factors in their potential development.

Prerequisite, Soc 561 or permission of instructor. *Credit, 3.* Mr. Wilkinson.

763. FERTILITY AND SOCIETY.

Past and present trends in fertility in Western and non-Western culture. Attention to problems of measurement, to interrelations between fertility and other social and economic variables, and to the quantitative and qualitative implications of contemporary research.

Prerequisite, Soc 561 or permission of instructor. *Credit, 3.* Mr. Yaukey.

764. POPULATION CHARACTERISTICS
AND SOCIOECONOMIC CHANGE.

Analysis of relationship between selected demographic characteristics and socio-economic changes, with attention to the sociological uses of statistical information on the world's countries.

Prerequisite, Soc 561 or permission of instructor. *Credit, 3.* Mrs. Golden.

765. TECHNIQUES OF DEMOGRAPHIC ANALYSIS.

The methods for gathering population data and the uses of these data to measure mortality, fertility, migration and population composition. The theoretical interrelations among these factors. Methods for making population estimates and projections.

Credit, 3 or 6. Mr. Yaukey.

766. HUMAN ECOLOGY:
COMMUNITY STRUCTURE
AND INTERRELATIONS.

An investigation of theory and research of community functions and systems of communities with special reference to ecological organization and change.

Credit, 3. Mr. Mehta.

772. POPULATION OF INDIA
AND PAKISTAN.

Trends in population growth and its distribution among various social strata. An assessment of the relative influence of fertility, mortality, migration, social organization, and cultural values on growth patterns.

Prerequisite, Soc 561 and 795.

Credit, 3. Mr. Driver.

781. HISTORY OF SOCIOLOGICAL
THEORY.

A survey of literature from classical times to the Utilitarians.

Prerequisite, Soc 282 or permission of instructor. *Credit, 3.* Mr. Manfredi.

782. THE DEVELOPMENT OF
SOCIOLOGICAL THEORY.

Selected European and American contributors and their systems of theory, in biographical, historical, and sociological perspective. Prerequisite, permission of instructor.

Credit, 3. Mr. Page.

783. CONTEMPORARY SOCIOLOGICAL
THEORY.

The literature from 1900 to the present.

Prerequisite, Soc 282 or permission of instructor. *Credit, 3.* Mr. Gordon.

784. ADVANCED SOCIOLOGICAL
THEORY.

A methodological analysis of contemporary sociological theory with emphasis on theory

construction, formalization and evaluation.
Prerequisite, Soc. 282 or permission of instructor.

Credit, 3. Mr. Wilson.

785. COMPLEX ORGANIZATIONS.

Major theories of organization, with emphasis on recent findings on the determinants of individual behavior and organizational effectiveness.

Credit, 3. Mr. Tausky.

792. PROBLEMS OF THEORETICAL ANALYSIS IN CONTEMPORARY SOCIOLOGY.

Alternative theoretical orientations, including neo-positivism, functionalism, systems theory, phenomenology; problems of intellectual style, sociology and other disciplines; human perspectives; sociology of knowledge and of sociology.

Prerequisite, permission of instructor.

Credit, 3. Mr. Page.

795. RESEARCH METHODS.

Logical analysis of sociological inquiry; survey of major research techniques and examination of principal methodological problems in sociology.

Credit, 3. Mr. Chevan, Mr. Park.

796. RESEARCH METHODS.

Research techniques in sociology, including: formulating research objectives; collecting, processing and analyzing data for a project organized around the problems of measurement in sociology.

Prerequisite, Soc 547 and 795.

Credit, 3. Mr. Chevan, Mr. Park.

797. SURVEY DESIGN AND ANALYSIS.

Design and analysis of descriptive and explanatory sample surveys. Special attention to the problems of longitudinal studies designed to evaluate the effects of a complex experience.

Prerequisite, Soc 795.

Credit, 3. Mr. Chevan.

798. TECHNIQUES OF DATA COLLECTION IN SOCIAL RESEARCH.

The validity and reliability for various purposes of a number of observational techniques, including: the interview; the paper

and pencil questionnaire; content analysis and participant observation.

Prerequisite, Soc 795.

Credit, 3. Mr. Chevan.

800. MASTER'S THESIS.

Credit, 6.

900. DOCTORAL DISSERTATION.

COURSES OPEN TO BOTH GRADUATE AND UNDER-GRADUATE STUDENTS

547. ELEMENTARY STATISTICS.

Basic statistical principles and techniques with special reference to application in sociology.

Credit, 3. Mr. Park.

548. SOCIAL STATISTICS.

Introduction to principles of multivariate techniques, including sociology and related fields.

Prerequisite, Soc 547 or equivalent.

Credit, 3. Mr. Park.

551. URBAN SOCIOLOGY.

A comparative analysis of cities and urbanization with special reference to demographic characteristics of urban populations, urban ecology, and urban social structure.

Prerequisite, Soc 101 or permission of instructor.

Credit, 3. Mr. Mehta.

556. RACE RELATIONS.

Social, economic, and political aspects of racial problems in the U.S., with particular reference to the Negro and major ethnic groups. Problems resulting from contact of races in Asia, Africa, and South America.

Credit, 3. Mr. Gordon.

557. FAMILY.

Development of the customs of courtship and marriage of the contemporary American family; basic causes of changes and trends of the family including mate selection, marriage laws, marital prediction, husband-wife relations, and the role of the child.

Credit, 3. Mr. Korson.

558. SOCIAL INTERACTION.

The processes leading to the socialization of the group member, with emphasis on role properties, play, control models, and power definitions.

Credit, 3. Mr. O'Rourke.

561. POPULATION PROBLEMS.

Physical and social factors which influence population change through births, deaths, and migration, with emphasis on the population problems of underdeveloped areas in the world today. *Credit, 3.* Mr. Wilkinson.

565. THE POPULATION OF JAPAN.

A demographic survey of the history and development of modern Japan. Emphasis on the similarities and contrasts between Japan's demographic transition and that of the West, and the relevance of Japanese experience for contemporary underdeveloped nations.

Prerequisite, Soc 261 or equivalent.

Credit, 3. Mr. Wilkinson.

570. SOCIAL STRUCTURE OF INDIA.

Origins, distribution, and cultural traits of the major groups in India. Attention given to marriage, family, and caste patterns, and their relation to and positions in the economic and political system.

Credit, 3. Mr. Driver.

575. SOCIAL PROBLEMS.

Incidence, distribution, and interrelations among the major types of social tensions in human societies. Research projects and field trips likely.

Credit, 3. Mr. Lewis.

580. SOVIET SOCIETY.

Survey of the major social institutions, processes and problems of Soviet society with special reference to official and popular values and norms, stratification, social controls, the family, types of socialization and social problems (i.e., crime, delinquency, the misuse of leisure, rural migration, etc.). The nature and usefulness of various theoretical models of Soviet society.

Credit, 3. Mr. Hollander.

587. SOCIOLOGY OF MENTAL DISORDERS.

Influence of social factors on diagnosis, treatment, and possible etiology of mental disorders. Application of sociological concepts and methods in considering nature and extent of mental disorders, epidemiology,

resources for dealing with mental illness, mental hospitals, and the community in rehabilitation.

Prerequisite, Soc 286 or permission of instructor. *Credit, 3.* Mr. Piedmont.

592. BACKGROUND TO THE STUDY OF SOCIAL WELFARE.

Primarily for upper division and graduate students, describes historical development and current status of British and American concerns about poverty in the context of the Industrial Revolution; presents sociological perspectives concerning differentials in access to economic security and social rewards, and outlines problems of measurement and planning as related to social policies.

Credit, 3. Mr. Sutton.

593. ISSUES IN SOCIAL POLICY PLANNING.

Primarily for upper division and graduate students. Focus on systematic policy planning, the role of research and development and the role of the scientific community in domestic policy programming; and on selected substantive issues.

Credit, 3. Mr. Sutton.

INTERDEPARTMENTAL COURSES

SOCIAL SCIENCE 550. AFRICA, SOUTH OF THE SAHARA.

Introductory study of recent political, economic, and social developments in the principal countries in Africa, south of the Sahara.

Prerequisites, at least two courses in one or more of the following fields: government, economics, sociology.

Credit, 3.

SOCIAL SCIENCE 569. INDIA AND SOUTH ASIA.

Introductory study of recent political, economic, and social developments in India and the countries of South Asia.

Prerequisites, at least two semester courses in one or more of the following fields: government, economics, sociology, anthropology.

Credit, 3. Mr. Driver.

RELATED COURSES

PSYCH 780. ADVANCED SOCIAL
PSYCHOLOGY.

PSYCH 781. ATTITUDES.

PSYCH 784. GROUP DYNAMICS.

Speech

James E. Lynch, *Acting Head of the Department and Professor of Speech*, B.A., 1948; M.A., 1949; Ph.D., Michigan, 1955.

Doris E. Abramson, *Associate Professor of Speech*, B.A., Massachusetts, 1949; M.A., Smith, 1951; Ph.D., Columbia, 1967.

Vincent M. Bevilacqua, *Associate Professor of Speech*, B.A., 1957; M.A., Emerson, 1958; Ph.D., Illinois, 1961.

Jane Blankenship, *Associate Professor of Speech*, B.A., Akron, 1956; M.A., 1957; Ph.D., Illinois, 1961.

Thomas W. Bohn, *Assistant Professor of Speech*, B.A., Gustavus Adolphus College, 1963; M.S., Southern Illinois, 1964; Ph.D., Wisconsin, 1968.

Sidney Kraus, *Professor of Speech*, B.F.A., 1953; M.F.A., School of the Art Institute of Chicago, 1954; Ph.D., Iowa, 1959.

Louis Lerea, *Lecturer*, A.B., Brooklyn College, 1951; M.A., State University of Iowa, 1952; Ph.D., Pittsburgh, 1954.

Harry Mahnken, *Assistant Professor of Speech*, A.B., Geneva College, 1951; M.F.A., Carnegie Institute of Technology, 1955.

Ronald J. Matlor, *Assistant Professor of Speech*, B.A., Indiana State, 1960; M.S., 1962; Ph.D., Purdue, 1966.

Jay Melrose, *Professor of Speech*, B.A., Queens College, 1948; M.A., 1953; Ph.D., Illinois, 1954.

Arthur E. Niedeck, *Professor of Speech*, B.A., Ithaca College, 1930; M.A., Cornell, 1942.

E. Harris Nober, *Professor of Speech*, B.A., 1951; M.A., Brooklyn College, 1952; Ph.D., Ohio State, 1957.

George T. Pratt, *Principal, Clarke School for the Deaf*, A.B., Washington College, 1936; M.Ed., Duke, 1940.

Ronald F. Reid, *Professor of Speech*, B.A., Pepperdine College, 1950; M.A., New Mexico, 1951; Ph.D., Purdue, 1954.

Maurice E. Shelby, Jr., *Associate Professor of Speech*, A.B., Washington, 1960; Ph.D., Ohio State, 1963.

Hermann G. Stelzner, *Associate Professor of Speech*, A.B., Emerson, 1953; M.A., 1955; Ph.D., Illinois, 1957.

Ian B. Thomas, *Associate Professor of Electrical Engineering*, B.E. (Elec.), University of Queensland, 1958; B.Sc. (Phys.), 1959; M.S., University of Illinois, 1961; Ph.D., 1966.

Walther Volbach, *Visiting Professor of Speech*, Ph.D., Munster, Germany, 1920.

Karl R. Wallace, *Professor of Speech*, A.B., 1927; A.M., 1931; Ph.D., Cornell, 1933.

M. James Young, *Assistant Professor of Speech*, B.A., Asbury College, 1948; M.A., Michigan State, 1953; Ph.D., Michigan, 1961.

The Department of Speech offers work leading toward the M.A., M.F.A., and Ph.D. degrees. Candidates for the M.A. degree should select one of the following major areas of concentration: (1) communication disorders (speech and hearing sciences), (2) mass communications, (3) rhetoric and public address, (4) theatre and oral interpretation, or (5) speech-theatre education.

Graduate study leading to the M.A. in communication disorders is designed to prepare students for careers as speech pathologists or audiologists or for doctoral study in these fields. Graduate work leading to the M.A. in rhetoric-public address and theatre-oral interpretation emphasizes theoretical, historical and critical studies of these subjects and is designed primarily to prepare students for doctoral study and for careers in college and university teaching and re-

search. Graduate work leading to the M.A. in speech education is a more general course-of-study to prepare candidates for secondary school teaching of public speaking, oral interpretation, debate and theatre.

Graduate study leading to the M.F.A. emphasizes the production aspects of theatre, and students concentrate in either acting-directing or design-technical. Graduate study leading to the Ph.D. in Speech with a concentration in rhetoric and public address is designed to prepare scholar-teachers who can explain, explore and evaluate concepts relating to theories of discourse and who are concerned with research having implications for rhetorical theory and practice. In addition, doctoral candidates will be expected to be familiar with the history and criticism of public address and critical theories and methods. Further developments of the Ph.D. program awaits additions to the faculty and additional courses. Present plans are for establishing major concentrations in mass communications and communication disorders (speech and hearing sciences) in 1971; in speech-theatre education in 1972; and in theatre and oral interpretation in 1973.

The department requires a reading knowledge of one foreign language sufficient to understand journals in the language in the student's academic discipline, or statistics, as represented by completion of two semesters of work. The Guidance Committee may require additional competencies if deemed appropriate to the candidate's research.

Applicants to the graduate program should meet all requirements for admission to the Graduate School and either have a good undergraduate background in speech or correct deficiencies without graduate credit. Candidates must complete 30 credits for the M.A. with thesis option, 33 credits for the M.A. with a non-thesis option, 60 credits for the M.F.A., and a minimum of 60 credits beyond the bachelor's degree exclusive

of credits for theses and dissertations for the Ph.D. Plans of study are prepared individually in consultation with faculty advisers.

COURSES OPEN TO GRADUATE STUDENTS ONLY.

(For either major or minor credit)

700. SPECIAL PROBLEMS.

Independent study in special subjects. No more than 9 credits may be applied toward the M.A.

Credit, 1-3 each semester. Max., 9. Staff.

711. RHETORICAL CRITICISM.

Selected theories and methods of rhetorical criticism and their applications.

Prerequisite, Speech 205 and one other course in rhetorical theory.

Credit, 3. Mr. Stelzner.

713. THEORIES OF LANGUAGE AND STYLE.

Examination of theories of language and style from ancient times to the present with emphasis on their application to rhetorical theory and criticism.

Prerequisite, 12 credits in rhetoric.

Credit, 3. Miss Blankenship.

714. EXPERIMENTAL STUDIES IN PERSUASION THEORY.

Examination of quantitative research studies in persuasion with attention to experimental research.

Prerequisites, Speech 211/511 and 350/650.

Credit, 3. Staff.

715. DIRECTING THE FORENSIC PROGRAM.

Problems related to forensic programs: coaching individual and group activities, judging, tournament administration, and administration of the entire forensics program.

Prerequisite, permission of instructor.

Credit, 3. Mr. Matlon.

718. SEMINAR IN PUBLIC ADDRESS.

Selected topics in the history and criticism of public address.

Prerequisite, permission of instructor. May repeat for a total of 6 credits

Credit, 3-6. Staff.

719. SEMINAR IN RHETORICAL
THEORY.

Selected topics in rhetorical theory; detailed consideration of the relationship of rhetoric to other disciplines, specific concepts, periods, and figures.

Prerequisite, permission of instructor. May repeat for a total of 6 credits.

Credit, 3-6. Staff.

733. MASS PERSUASION.

The process, functions and effects of persuasion on a mass level with attention to the role of the mass media.

Credit, 3. Mr. Bohn.

734. FILM AND SOCIETY: THE
CINEMA AS A SOCIAL FORCE.

The affective and reflective roles of film in society, with emphasis on the relationship of society to the structure, development, function and effects of the motion picture.

Credit, 3. Mr. Stromgren.

741. ADVANCED SCENE DESIGN.

Special problems in conceiving the visual elements of theatre. Experimental design and design for atypical theatre structures emphasized.

Prerequisite, Speech 241 or equivalent.

Credit, 3. Staff.

742. HISTORY OF THEATRICAL
COSTUME I.

Detailed study of period costumes from primitive man to the Seventeenth Century with projects in design from a number of these periods.

Prerequisite, Speech 242 or equivalent.

Credit, 3. Miss Weiss.

743. HISTORY OF THEATRICAL
COSTUME II.

Detailed study of period costume from the Seventeenth Century to the present with projects in design from a number of these periods.

Prerequisite, Speech 242 or equivalent.

Credit, 3. Miss Weiss.

744. ADVANCED ACTING.

Investigation of an experimentation with various actor-character relationships.

Prerequisite, Speech 244 or equivalent.

Credit, 3. Mr. Young.

745. ADVANCED DIRECTING.

Various styles of staging period and contemporary dramas and an examination of these styles within their historical contexts.

Prerequisite, Speech 246 or equivalent.

Credit, 3. Mr. Mahnken.

747. TOPICS IN THEATRE
HISTORY.

Detailed study of selected eras in the development of theatre.

Credit, 3. Mr. Volbach.

748. TOPICS IN CONTEMPORARY
THEATRE.

Distinctive Twentieth Century theatrical concepts in Europe and the United States.

Credit, 3. Mr. Volbach.

756. THEATRE MANAGEMENT.

Modern theatrical production organization, economics, special contractual problems, and administration.

Credit, 3. Staff.

757. ADVANCED STAGE LIGHTING.

Aesthetics of stage lighting and the problems and practices of the lighting designer with emphasis on the lighting of selected plays.

Prerequisite, Speech 257 or equivalent.

Credit, 3. Staff.

758. THEATRE PRACTICUM.

Conception and execution of two creative theatrical assignments selected with and supervised by the student's adviser. The number of hours depends upon the projects which a student and his adviser establish. Typically, the sequence would be three hours credit for each of the M.F.A. candidate's first two semesters.

Credit, 1-6. Staff.

761. CONTEMPORARY DRAMATIC
THEORY AND CRITICISM.

An examination of important theories of dramatic art from 1900 to the present.

Prerequisite, Speech 261 or equivalent.

Credit, 3. Mr. Stewart.

763. THEATRE AND RITUAL.

Relationship of ritual and theatre from primitive man to Genet.

Credit, 3. Mr. Young.

765. THE RHETORIC OF THEATRE.
Theories of rhetoric and poetic as they are relevant to drama and (of specific approaches) to the rhetorical criticism of plays.

Credit, 3. Mr. Stewart.

770. HISTORY OF SPEECH
EDUCATION.

Speech pedagogy from ancient Greece to the present with emphasis on speech education in America.

Prerequisite, 18 graduate credits in Speech.
Credit, 3. Staff.

771. SEMINAR IN SPEECH
PEDAGOGY.

Selected topics relevant to the principles and methods of teaching speech. Attention will be given to the areas of rhetoric and theatre.

Prerequisite, 18 graduate credits in Speech.
Credit, 3. Staff.

781. VOICE PROBLEMS.

Voice disorders, organic and functional; symptoms and principles and techniques of therapy and diagnosis.

Prerequisites, Speech 182 and 284 or equivalents.
Credit, 3. Staff.

782. CLINICAL PRACTICUM.

Supervised clinical practice with children and adults with various speech and hearing disorders; group and individual therapy techniques.

Prerequisites, Speech 181, 182, 284 or equivalents.
Credit, 1-6. Staff.

783. EXPERIMENTAL PHONETICS.

Analysis of phonetic elements of language, emphasis on laboratory instrumentation and research techniques.

Prerequisites, Speech 181 and 284 or equivalents.
Credit, 3. Mr. Nerbonne.

784. ORGANIC PATHOLOGIES OF
SPEECH.

Etiology, classification, evaluation, and speech rehabilitation of cleft palate, laryngectomy, and other organic pathologies of speech.

Prerequisites, Speech 283/583 and 284/584.
Credit, 3. Staff.

785. NEUROPHYSIOLOGICAL
DISORDERS OF SPEECH.

Etiology, classification, evaluation, and speech and language rehabilitation of cerebral palsied children and aphasic adults.

Prerequisites, Speech 284/584 and 289/589.
Credit, 3. Staff.

786. PSYCHONEUROLOGICAL
DISORDERS OF SPEECH.

Evaluation, classification and rehabilitation of speech of mentally retarded and perceptually handicapped children with some consideration of other psychoneurological conditions.

Prerequisite, Speech 289/589.

Credit, 3. Staff.

787. HEARING CONSERVATION.

Identification and management of the hearing impaired in hospitals, public schools, and industry. Consideration of noise control and other preventative measures.

Prerequisite, Speech 285/585.

Credit, 3. Mr. Tokay.

788. ADVANCED CLINICAL
AUDIOLOGY.

Theories, methodologies, and procedures for special diagnostic testing in audiology. Hearing, selection and evaluation procedures.

Prerequisite, Speech 285/585.

Credit, 3. Mr. Tokay.

789. TRENDS IN CONTEMPORARY
AUDIOLOGY.

Investigation and evaluation of the recent research and advances in knowledge concerning the auditory capacities, and the management of audiological problems.

Prerequisite, Speech 788.

Credit, 3. Mr. Nober.

791. CLINICAL SUPERVISION IN
SPEECH PATHOLOGY AND
AUDIOLOGY.

Organization, management, and supervision of speech pathology and audiology programs in public schools, rehabilitation centers, hospital clinics, and in special education residential settings.

Prerequisite, permission of instructor.

Credit, 3. Staff.

800. MASTER'S THESIS.

Credit, 3-6. Staff.

810. SEMINAR IN RESEARCH
TOPICS AND METHODS.

Desirable areas and topics of investigation; applicable methodology and bibliography. Tentative exploration of selected subjects. Offered for doctoral students as needed, with sections arranged for each of the principal areas of the department.

Credit, 3. Staff.

812. SEMINAR IN CONTEMPORARY
RHETORICAL PRACTICE
AND CRITICISM.

Intensive study and analysis of the speaking and writing generated by a major public controversy, 1930 to the present.

Credit, 3. Staff.

900. DOCTORAL DISSERTATION.

COURSES OPEN TO BOTH
GRADUATE AND UNDER-
GRADUATE STUDENTS
(For either major or minor credit)

505. CLASSICAL RHETORICAL
THEORY.

Major rhetorical theories from the emergence in ancient Greece to the late Roman Empire. Emphasis on the Sophists, Plato, Aristotle, Hermagoras, Cicero, Quintilian, and St. Augustine.

Prerequisite, Speech 105 or permission of instructor.

Credit, 3. Mr. Phinney.

506. EARLY MODERN RHETORICAL
THEORY.

The impact of contemporaneous science, philosophy, and aesthetics on rhetorical theory from 1600 to 1900. Emphasis on the Eighteenth Century Rhetorical Renaissance.

Prerequisite, Speech 105 or 205 or permission of instructor.

Credit, 3. Mr. Bevilacqua.

507. AMERICAN PUBLIC ADDRESS.

Reading and analysis of selected American speeches which have been influential in shaping our culture and history by reconstructing the circumstances under which

they were given and by exploring the speaker's means of persuasion.

Prerequisite, Speech 105.

Credit, 3. Mr. Reid.

509. BRITISH PUBLIC ADDRESS.

British speakers and speeches with emphasis on the reciprocal influence of rhetoric and the development of British culture, society and institutions.

Prerequisite, Speech 105. *Credit, 3. Staff.*

510. MEDIEVAL AND RENAISSANCE
RHETORICAL THEORY.

The developments in rhetorical theory from the beginning of the Middle Ages through the Sixteenth Century.

Prerequisite, Speech 105 or 205 or permission of instructor.

Credit, 3. Staff.

511. CONTEMPORARY
RHETORICAL THEORY.

Contemporary approaches to rhetorical theory and communication behavior. Attention to the analytical, critical, and philosophical methods.

Prerequisites, Speech 105 or 205 or permission of instructor.

Credit, 3. Miss Blankenship.

527. FILM THEORY AND
CRITICISM.

The various modes and structures of film communication and the basis for evaluating films according to their communicative and aesthetic values.

Prerequisite, Speech 225.

Credit, 3. Mr. Stromgren.

528. RADIO, TELEVISION, FILM
AND SOCIETY.

The affective and reflective roles of the radio, television, and film media in society.

Prerequisite, Speech 121.

Credit, 3. Mr. Lynch.

532. BROADCASTING AND THE
GOVERNMENT.

The role, function, and effect of regulation on broadcasting.

Credit, 3. Mr. Shelby.

540. TECHNICAL PRODUCTION.

The materials and methods in construction for the stage.

Prerequisites, Speech 115 and 140.

Credit, 3. Staff.

541. PRINCIPLES OF SCENE
DESIGN.

Intensive study of the principles of scene design and the application of these principles to a series of design projects. Practical experience will be gained through laboratory work in scene painting and decoration. Prerequisites, Speech 115 and 140.

Credit, 3. Mr. Fiala.

542. DESIGN AND CONSTRUCTION
OF COSTUME.

Silhouette, draping, color, texture, drafting of patterns, construction, and the application of these basic principles to a series of design projects.

Prerequisites, Speech 115 and 140.

Credit, 3. Miss Weiss.

544. ACTING II.

Character analysis and development with attention to the inter-relationship of characters.

Prerequisites, Speech 115 and 243.

Credit, 3. Mr. Young.

546. DIRECTING II.

Problems in the interpretation and staging of various types of contemporary drama. Attention to rehearsal and performance procedures.

Prerequisite, Speech 245.

Credit, 3. Mr. Mahnken.

547. THEATRE HISTORY I.

The history of theatre in western civilization from its beginning to 1642; an investigation of the Classical, Medieval, and Renaissance theatres with emphasis on the origins and development of drama, spectacle, theatre production, and theatre architecture.

Credit, 3. Mr. Volbach.

548. THEATRE HISTORY II.

History of the theatre in western civilization with emphasis on the 18th and 19th Centuries, the Continental, English, American, and Modern Theatres.

Credit, 3. Mr. Volbach.

550. SPEECH AND LANGUAGE
THEORY.

The nature of speech and language and the process involved in acquiring, understanding

and producing speech and language.

Prerequisite, permission of instructor.

Credit, 3. Mr. Nober.

551. ORAL INTERPRETATION OF
CHILDREN'S LITERATURE.

Selection and interpretation of literary materials for children.

Credit, 3. Mrs. Aldrich.

552. ADVANCED ORAL INTERPRE-
TATION OF LITERATURE.

Concentration upon the philosophical and technical bases for reading the lyric poem, fiction, drama and documentary materials.

Prerequisite, Speech 152.

Credit, 3. Mr. Brann.

553. CHILDREN'S DRAMA I.

Principles and methods of informal dramatic activities for children.

Credit, 3. Mrs. Aldrich.

554. CHILDREN'S DRAMA II.

Principles and methods of formal dramatic activities for children.

Prerequisite, Speech 253/553.

Credit, 3. Mrs. Aldrich.

557. STAGE AND TELEVISION
LIGHTING.

Principles, practices and equipment involved in stage and television lighting.

Prerequisites, Speech 115 and 140.

Credit, 3. Staff.

561. HISTORY OF DRAMATIC
THEORY.

A survey of important trends and documents in the history of dramatic theory from Plato to 1900.

Prerequisite, Speech 260.

Credit, 3. Mr. Stewart.

562. THE BLACK PRESENCE IN
AMERICAN DRAMA.

Selected works by American white and black playwrights, from mid-Nineteenth Century to the present, with emphasis on the image of the Negro presented in these plays and productions.

Credit, 3. Miss Abramson.

564. HISTORY OF THE AMERICAN
THEATRE AND DRAMA.

The history of the American theatre from its

beginnings in the Eighteenth Century to the present day. Concerned in each period with the drama itself, the building in which it is performed, scenic effects, and the contributions of actor and director.

Credit, 3. Miss Abramson.

583. VOICE AND ARTICULATION DISORDERS.

Basic principles and methods involved in the rehabilitation of voice and articulation disorders. Emphasis on types of defects, diagnosis and evaluation of defects, and therapeutic procedures. Laboratory observation of voice and articulation therapy.

Prerequisites, Speech 181 and 182.

Credit, 3. Staff.

584. ANATOMY AND PHYSIOLOGY OF THE SPEECH AND HEARING MECHANISM.

The anatomy and physiology of the speech and hearing mechanism; consideration of respiration, phonation, resonance, articulation, and audition.

Credit, 3. Mr. Nerbonne.

585. AUDIOLOGY.

Physics of sound; physiology and neurology of hearing. Symptoms and causes of hearing loss; attention to selected diagnostic testing procedures. Supervised practice in audiometric testing.

Prerequisite, Speech 182.

Credit, 3. Mr. Nober.

586. REHABILITATION OF THE ACOUSTICALLY HANDICAPPED.

Techniques of speech therapy, auditory training, and speech reading for hard of hearing children and adults; multi-sensory approach to language development. Laboratory practice under supervision.

Prerequisite, Speech 285.

Credit, 3. Mr. Tokay.

587. HEARING AND SPEECH SCIENCE.

Investigation of fundamental physical characteristics of acoustic stimuli as they relate to hearing and speech processes. Laboratory exercises in the use of instrumentation applicable to the analysis of speech stimuli.

Prerequisites, Speech 181 and 182.

Credit, 3. Mr. Nerbonne.

588. CLINICAL PRACTICE.

Supervised experience in therapy with individuals having articulatory type disorders. May be repeated once.

Prerequisites, Speech 181 and 182.

Credit, 1-3 each semester. Staff.

589. SPEECH AND LANGUAGE DISORDERS.

Etiologies and rehabilitation of psychological and neurological speech and language disorders.

Prerequisite, Speech 250/550.

Credit, 3. Staff.

590. STUTTERING.

Major theories of the etiology, diagnosis, and clinical management of stuttering.

Prerequisite, Speech 289/589.

Credit, 3. Staff.

591. AUDITORY DISORDERS IN CHILDREN.

Audiometric evaluation and procedures applied to the diagnosis of auditory impairments in children from infancy through elementary school. Language development of the pre-school deaf child. Techniques of parent counseling.

Prerequisites, Speech 285/585, 286/586.

Credit, 3. Mr. Tokay.

592. LEARNING AND LANGUAGE DISABILITIES IN CHILDREN.

Learning disabilities associated with physical, psychological, and social etiologies. Consideration of problems of language development and cognitive disorders, remedial practices in reading and writing problems, and learning patterns of the culturally disadvantaged. Diagnostic assessment and educational processes outlined.

Credit, 3. Mr. Nober.

650. INTRODUCTION TO SPEECH RESEARCH.

Introduction to research methods, bibliographical resources, and professional writing in the field of Speech.

Prerequisite, 12 undergraduate credits in Speech.

Credit, 2. Staff.

690. SEMINAR IN SPEECH
PATHOLOGY.

Individual student reports on selected topics.
Prerequisite, Speech 182. Credit, 3. Staff.

691. SEMINAR IN MASS
COMMUNICATIONS.

Individual and group research, analysis, examination, and discussion of major problems in mass communications.

Prerequisites, 9 hours of courses in mass communication. Credit, 3. Staff.

Veterinary Science

(See Animal Science, page 54.)

Wildlife and Fisheries

Biology

GRADUATE FACULTY

Arnold D. Rhodes, *Head of the Department of Forestry and Wildlife Management* and Professor of Forestry, B.S., New Hampshire, 1934; M.F., Yale, 1937.

Carl A. Carlozzi, *Associate Professor of Resource Planning*, B.S., Kent State, 1955; M.A., 1957; Ph.D., Michigan, 1965.

Charles F. Cole, *Associate Professor of Fisheries Biology*, B.A., Cornell, 1950; Ph.D., 1957.

Wendell E. Dodge, *Associate Professor of Wildlife Biology*, B.A., New Hampshire, 1955; M.S., Massachusetts, 1958; Ph.D., 1967.

Frederick Greeley, *Associate Professor of Wildlife Biology*, B.A., Kenyon College, 1941; M.S., Wisconsin, 1949; Ph.D., 1954.

James E. Johnson, *Assistant Professor of Fisheries Biology*, B.A., Purdue, 1962; M.S., Butler, 1965; Ph.D., Arizona State, 1969.

Joseph S. Larson, *Associate Professor of Wildlife Biology*, B.S., Massachusetts,

1956; M.S., 1958; Ph.D., Virginia Polytechnic Institute, 1966.

James A. McCann, *Associate Professor of Fisheries Biology*, B.S., Massachusetts, 1956; M.S., Iowa State, 1958; Ph.D., 1960.

Roger J. Reed, *Associate Professor of Fisheries Biology*, B.S., Pittsburgh, 1951; M.S., 1953; Ph.D., 1956.

William G. Sheldon, *Professor of Wildlife Biology*, B.A., Yale, 1933; M.S., Cornell, 1947; Ph.D., 1948.

David K. Wetherbee, *Associate Professor of Wildlife Biology*, B.A., Clark, 1950; M.A., 1952; Ph.D., Connecticut, 1959.

Most applicants for admission to study for advanced degrees in wildlife or fisheries biology must have completed a Bachelor's degree in the biological sciences. Occasional exceptions are made for applicants from other fields, provided they make up their deficiencies in basic biology as part of their graduate program. Applicants for admission to the doctoral program should also have a sound background in the basic biological sciences, and in the physical sciences and mathematics as well. Candidates for either degree are admitted under the general requirements of the Graduate School. The option which applicants wish to select, wildlife or fisheries biology, should be clearly indicated on the application form. The selection of courses of study is done by the student and his guidance committee. Scores from the Graduate Record Examinations, including Advanced Biology test, are required and should accompany the application.

Graduate students pursue courses of study directed toward acquiring proficiency in independent research in one option or the other (wildlife or fisheries). Work in fisheries involves both fresh water and marine environments. In wildlife, ecological and resource planning studies are conducted both in the field and in the laboratory. Courses may be taken in the department and in related fields in other departments. The department requires that all doctoral candidates

possess a reading knowledge in one foreign language sufficient to understand journal material. A research thesis is normally required for Master of Science candidates. Graduate students may conduct research under the supervision of the Cooperative Wildlife and Fishery Units and are eligible for support from the Units which is provided by the Massachusetts Division of Fisheries and Game, the Massachusetts Division of Marine Fisheries, and the United States Bureau of Sport Fisheries and Wildlife.

Undergraduates who receive the Bachelor's degree in fisheries or wildlife biology at the University are urged to pursue graduate work at other universities, many of which also have Cooperative Research Units.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS IN WILDLIFE OR FISHERIES BIOLOGY.

*Credit, 3 per semester.
Maximum credit, 6. Staff.*

701, 702. SEMINAR IN WILDLIFE AND/OR FISHERIES BIOLOGY.

Review and discussion of the literature in Wildlife and Fisheries Biology, including such subjects as population dynamics and manipulation, fish and game law and administration, Afro-Eurasian problems, influence of land-use, Arctic environments and others.

*Credit, 1-3 per semester.
Maximum credit, 6. Staff.*

756. FISHERIES BIOMETRICS.

The statistical treatment of fisheries research problems, including studies on age and growth, food habits, population estimates, condition factors, and population dynamics. Prerequisites, Fish Biol 565 and Stat 121 or permission of instructor.

Credit, 3. Mr. McCann.

757. ADVANCED FISHERIES MANAGEMENT.

Scientific basis for modern fisheries management, emphasizing cold-water fishes, anadromous species, large reservoir and river fisheries, and conflicts of interest with other water uses.

Prerequisites, Fish Biol 565 and 756, or permission of instructor. *Credit, 3. Staff.*

758. ADVANCED WILDLIFE MANAGEMENT.

Interrelationships of wildlife and forestry, grazing, cultivation, pollution and other uses of natural resources.

1971-72 and alternate years.

Credit, 3. Staff.

800. MASTER'S THESIS *Credit, 6-10.*

900. DOCTORAL DISSERTATION. *Credit, 30.*

COURSES OPEN TO BOTH GRADUATE AND UNDERGRADUATE STUDENTS.

(For either major or minor credit)

561. PRINCIPLES OF WILDLIFE BIOLOGY.

Fundamental ecology and principles of Wildlife Management, with emphasis on population characteristics and responses.

Credit, 3. Mr. Greeley.

562. TECHNIQUES OF WILDLIFE BIOLOGY.

Methods of collecting and interpreting data in Wildlife Management, with emphasis on field and laboratory experience in census methods and criteria for determining sex, age and other characteristics of wild birds and mammals. *Credit, 3. Mr. Larson.*

563. MANAGEMENT OF WETLAND WILDLIFE.

Life histories, identification and habitat requirements of waterfowl and marshland fur-bearing animals; management of wetland habitats with emphasis on governmental policy.

1970-71 and each alternate year.

Credit, 3. Mr. Larson.

564. MANAGEMENT OF
UPLAND WILDLIFE.

Life histories, identification and habitat requirements of upland game birds, game mammals, and furbearers; management of upland habitats.

1971-72 and alternate years.

Credit, 3. Mr. Greeley.

565. TECHNIQUES OF
FISHERIES BIOLOGY.

Principles and techniques of fishery management, stressing population and growth dynamics, and field procedures.

Credit, 3. Mr. Cole.

567. LABORATORY IN
PRINCIPLES OF
FISHERY BIOLOGY.

Field techniques in fishery biology; operation and use of fishery research and management equipment. Laboratory analysis of field-collected data using automatic data processing; manuscript preparation. Concurrent enrollment in Fish Biol 565.

One 4-hour laboratory.

Credit, 1. Mr. Reed.

570. ECOLOGY OF FISHES.

Biological responses of fishes to the environment. Aspects of feeding, home range, breeding behavior, and other responses to the environment.

Prerequisites, Fish Biol 565 and Zool 602 or permission of instructor.

Credit, 3. Mr. Cole.

572. INTRODUCTION TO
MARINE FISHERIES.

Factors affecting world marine fisheries resources and development. Review of selected species of commercial importance and of selected world fisheries. Several overnight field trips requiring Saturday attendance by arrangement.

Prerequisites, Fish Biol 565 and Zool 600 or permission of instructor.

Credit, 3. Mr. Cole.

Zoology

GRADUATE FACULTY

Harold Rauch, *Acting Head of the Department and Professor of Zoology, B.S.,*

Queens College, 1944; M.S., Illinois, 1947; Ph.D., Brown, 1950.

Everett Anderson, *Professor of Zoology, B.A., Fisk University, 1949; M.A., 1951; Ph.D., State University of Iowa, 1955.*

Lawrence M. Bartlett, *Professor of Zoology, B.S., Massachusetts, 1939; M.S., 1942; Ph.D., Cornell, 1949.*

D. Craig Edwards, *Assistant Professor of Zoology, B.S., Swarthmore, 1961; Ph.D., Chicago, 1965.*

Donald Fairbairn, *Professor of Zoology, B.A., Queens University, Canada, 1938; Ph.D., Rochester, 1942.*

Bronislaw M. Honigberg, *Professor of Zoology, B.A., California at Berkeley, 1943; M.A., 1946; Ph.D., 1950.*

Yoshihiro Kato, *Associate Professor of Zoology, B.S., Tokyo University, 1948; M.S., California at Berkeley, 1956; Ph.D., Washington University, 1959.*

Mindaugas S. Kaulenas, *Assistant Professor of Zoology, B.Sc., University of London, 1961; Ph.D., 1964.*

David J. Klingener, *Associate Professor of Zoology, B.A., Swarthmore, 1959; M.A., Michigan, 1961; Ph.D., 1964.*

Mary Ann Klouda, *Assistant Professor of Zoology, A.B., College of Notre Dame, 1958; Ph.D., Loyola University (Chicago), 1964.*

Joseph G. Kunkel, *Assistant Professor of Zoology, B.A., Columbia, 1964; Ph.D., Case Western Reserve University, 1968.*

Stuart D. Ludlam, *Associate Professor of Zoology, B.A., Cornell, 1960; Ph.D., 1964*

Arthur P. Mange, *Associate Professor of Zoology, B.S., Cornell, 1954; M.S., Wisconsin, 1958; Ph.D., 1963.*

John G. Moner, *Associate Professor of Zoology, B.A., Johns Hopkins, 1949; M.A., Princeton, 1951; Ph.D., 1953.*

William B. Nutting, *Professor of Zoology, B.S., Massachusetts, 1940; M.S., 1948; Ph.D., Cornell, 1950.*

W. Brian O'Connor, *Assistant Professor of Zoology, B.A., St. Michael's, 1962; M.S., Purdue, 1966; Ph.D., 1967.*

Herbert E. Potswald, *Assistant Professor*

of Zoology, B.A., University of Minnesota, 1959; Ph.D., University of Washington, 1964.

John L. Roberts, *Professor of Zoology*, B.S., Wisconsin, 1947; M.S., 1948; Ph.D., California at Los Angeles, 1952.

Larry S. Roberts, *Associate Professor of Zoology*, B.S., Southern Methodist University, 1956; M.S., Illinois, 1958; D.Sc., Johns Hopkins, 1961.

H. Duncan Rollason, Jr., *Associate Professor of Zoology*, A.B., Middlebury, 1939; M.A., Williams, 1941; A.M., Harvard, 1943; Ph.D., 1949.

Theodore D. Sargent, *Associate Professor of Zoology*, B.S., Massachusetts, 1958; M.S., Wisconsin, 1960; Ph.D., 1963.

Dennis G. Searcy, *Assistant Professor of Zoology*, B.S., Oregon State, 1964; Ph.D., California at Los Angeles, 1968.

James G. Snedecor, *Professor of Zoology*, B.S., Iowa State, 1939; Ph.D., Indiana University, 1947.

Dana P. Snyder, *Associate Professor of Zoology*, B.S., Illinois, 1947; M.S., 1948; Ph.D., Michigan, 1951.

Gordon A. Wyse, *Assistant Professor of Zoology*, B.S., Swarthmore, 1961; M.S., University of Michigan, 1963; Ph.D., 1967.

ASSOCIATED FIVE-COLLEGE GRADUATE FACULTY

Lincoln P. Brower, *Associate Professor of Biology*, (Amherst College), A.B., Princeton, 1953; Ph.D., Yale, 1957.

Elizabeth M. Boyd, *Professor of Zoology*, (Mount Holyoke College), B.Sc., Edinburgh University, 1930; M.A., Mount Holyoke College, 1933; Ph.D., Cornell, 1946.

Joyce M. Greene, *Assistant Professor of Zoology*, (Smith College), A.B., Bryn Mawr, 1957; M.A., Wesleyan, 1960; Ph.D., 1968.

Jane C. Kaltenbach, *Assistant Professor of Zoology*, (Mount Holyoke College), B.S., Beloit College, 1944; M.A., Wisconsin, 1946; Ph.D., Iowa, 1950.

Louise M. Luckenbill, *Assistant Professor of Zoology*, (Smith College), B.A., Oberlin, 1958; Ph.D., Brown, 1964.

Jeanne Powell, *Assistant Professor of Zoology*, (Smith College), A.B., Pembroke College, 1954; M.A., Bryn Mawr, 1959; Ph.D., 1967.

Marilyn K. Pryor, *Assistant Professor of Zoology*, (Mount Holyoke College), B.S., Madison College, 1956; M.S., University of Tennessee, 1958; Ph.D., 1961.

Curtis G. Smith, *Associate Professor of Zoology*, (Mount Holyoke College), A.B., Chicago, 1948; Ph.D., 1954.

Isabelle B. Sprague, *Professor of Zoology*, (Mount Holyoke College), A.B., Mount Holyoke College, 1937; M.A., 1939; Ph.D., University of Kansas, 1953.

George W. de Villafranca, *Professor of Zoology*, (Smith College), B.S., Yale, 1948; Ph.D., 1953.

Hugh Wallace, *Assistant Professor of Biology*, (Amherst College), B.A., Oxford University, England, 1956; M.A., 1960; D. Phil., 1962.

Albert E. Wood, *Professor of Biology*, (Amherst College), B.A., Princeton, 1930; M.A., Columbia, 1932; Ph.D., 1935.

UNIVERSITY OF MASSACHUSETTS/ BOSTON GRADUATE FACULTY

Francois Vuilleumier, *Assistant Professor of Biology*, Licences es Sciences Naturelles, University of Geneva, Switzerland, 1961; Ph.D., Harvard, 1967.

The Zoology Department offers graduate work leading to the Master of Arts, Master of Science and Doctor of Philosophy degrees. Facilities are available for advanced study in the major fields of zoology including genetics, cytology, physiology and biochemistry, vertebrate and invertebrate zoology, limnology, ecology and behavior, developmental biology, and parasitology. Graduate training prepares students for university teaching and research, Federal and state positions in the biological fields, research positions with

industrial and pharmaceutical companies and biomedical institutions, and high school and junior college teaching.

Requests for application forms as well as for information pertaining to the graduate program should be directed to the Zoology Department. All application materials, letters of recommendation and transcripts should be sent directly to the Head of the Department; scores from the Graduate Record Examinations should accompany the application.

Advanced Degrees. Applications are accepted from students who have demonstrated superior ability as undergraduates. Undergraduate preparation should include at least 20 hours in biology, preferably including courses in genetics, comparative anatomy, embryology, invertebrate zoology, and physiology, as well as courses in mathematics through elementary calculus, general physics, organic chemistry, and a foreign language (French, German, or Russian). Early in his graduate career, the graduate student must demonstrate his proficiency, by examination, in major areas of zoology.

Preparation for such examinations can be made by formal enrollment in appropriate courses or by independent study of recommended readings.

Since teaching experience is regarded as an important part of graduate training, all students are required to teach half-time for two semesters unless equivalent experience has been obtained previously at another university.

All graduate students must enroll in Zoology 850, Seminar. A minimum of one credit per year of residence is required.

Master of Arts or Master of Science. One of two plans may be followed in fulfillment of the requirements for the Master's degrees:

WITH THESIS: In addition to the thesis, the student must offer a minimum of 20 graduate credits, at least six of which must be earned in 701-900 series courses.

WITHOUT THESIS: A minimum of 30 graduate credits must be offered, of which at least six must be earned in 701-900 series courses and six to nine in Zoology 700, Special Problems.

All candidates must pass the graduate reading examination at the intermediate level in one foreign language (ordinarily French, German, or Russian) and a final oral comprehensive examination.

Doctor of Philosophy: A student is formally admitted as a candidate for the doctorate when he has demonstrated general proficiency as previously described and has successfully completed an oral preliminary examination based on advanced concepts in one major and two minor areas selected from the following: genetics, developmental biology, cell biology, ecology and behavior, physiology and biochemistry, parasitology, systematics and evolution. With the consent of his Guidance Committee he may substitute equivalent work in another department as one minor area. Selection of courses is not restricted to the subjects to be presented for examination. All students must complete the departmental language requirement before taking the oral preliminary examination. This requirement is 1) reading proficiency at the intermediate level in two foreign languages, or 2) reading proficiency at the advanced level in one foreign language. Foreign students whose native language is not English will be required to demonstrate reading proficiency at the intermediate level in one foreign language. Foreign languages are ordinarily selected from French, German, and Russian.

COURSES OPEN TO GRADUATE STUDENTS ONLY

(For either major or minor credit)

700. SPECIAL PROBLEMS.

Credit, 1-9. Staff.

702 (II). GENERAL CYTOLOGY.

The morphological features of cells in relation to their function. Lectures, seminar reports and individual laboratory work.

Prerequisite, Zool 523.

(Not offered in 1970-71)

Credit, 3.

708 (I). ELECTRON MICROSCOPY.

Lectures and laboratory on the electron microscope and methods of specimen preparation.

Prerequisite, permission of instructor.

Credit, 3. Mr. Anderson.

710 (II). FINE STRUCTURE AND
FUNCTION OF CELLS.

Lectures, discussions, reading and reports on fine structure of cells and dynamic morphology.

Prerequisites, Zool 523, 660.

(Not offered in 1971-72)

Credit, 3. Mr. Anderson.

720 (I). EXPERIMENTAL
EMBRYOLOGY.

Lectures and discussions on the causal analysis of animal development. Laboratory on *in vivo* and *in vitro* culture methods.

Prerequisites, Zool 680 or 527.

(Not offered in 1970-71)

Credit, 3. Mr. Kato.

724 (II). ADVANCED DEVELOP-
MENTAL BIOLOGY

Molecular basis of cell and tissue differentiation, with emphasis on gene action, synthesis and function of macromolecules and hormonal control of developmental processes.

Prerequisites, Biochemistry and/or Zool 660, Zool 540.

(Not offered in 1971-72)

Credit, 3. Mr. Kaulenas.

730 (II). PHYSIOLOGICAL
GENETICS.

The nature of the gene and its action in the developmental and physiological processes of the organism.

Prerequisites, Zool 540 and permission of instructor.

(Not offered in 1970-71)

Credit, 3. Mr. Rauch.

740 (II). ADVANCED INVERTE-
BRATE ZOOLOGY.

Continuation of Zoology 582 with emphasis on development.

Prerequisite, Zool 582.

(Not offered in 1971-72)

Credit, 3. Mr. Potswald.

744 (II). METAZOAN SYMBIOSIS.

Host-symbiont relationships of mutuals, commensals and parasites. Systematics, morphology, life histories, and physiology of metazoan symbionts of animals with emphasis on helminths. Laboratory on research techniques.

Prerequisites, Zool 581, 582, or 583; permission of instructor.

(Not offered in 1971-72)

Credit, 3. Mr. L. S. Roberts.

755 (I). SYSTEMATICS AND EVO-
LUTIONARY MECHANISMS.

A theoretical consideration of evolution and systematics at and above the species level.

Prerequisite, Zool 540.

(Not offered in 1970-71)

Credit, 3. Mr. Klingener.

757 (II). POPULATION AND
COMMUNITY ECOLOGY.

Distribution patterns of organisms, population growth and regulation, interspecific competition and other population interactions, and community structure and energetics. Sampling methods, use of models, individual and group projects in the laboratory.

Two hours lecture-discussion, one laboratory.

Prerequisites, one course each in ecology, invertebrate zoology, Math 124; statistics desirable.

Credit, 3. Mr. Edwards.

770 (I). COMPARATIVE
NEUROPHYSIOLOGY.

Sensory and nervous function in invertebrates and vertebrates with emphasis on integrative mechanisms underlying animal behavior.

Prerequisites, a year of chemistry and physics, and cell physiology or physiological psychology; or permission of instructor.

Credit, 3. Mr. Wyse.

780 (I) (II). PHYSIOLOGICAL
REGULATORY
MECHANISMS.

Detailed study of physiological regulation and its molecular basis in cells and organisms.

Prerequisites, Zool 660 and 670.

Credit, 2-4 per semester

Mr. J. L. Roberts, Mr. Moner.

784 (II). ENDOCRINOLOGY.

The importance of the endocrines in their control over normal functions (growth, metabolism, reproduction, etc.) in a variety of animals.

Two class hours, one 3-hour laboratory period.

Prerequisites, Zool 666.

Credit, 3. Mr. Snedecor.

810. TOPICS IN ZOOLOGY.

One or more topics of special or current interest covered in lectures and discussion.

Credit, 1-6 per semester. Staff.

850 (I) (II). SEMINAR.

In each semester a topic from each of the following areas is chosen for discussion: Cytology, Genetics and Developmental Biology; Physiology and Biochemistry; Environmental and Systematic Biology.

Credit, 1 each semester. Staff.

800. MASTER'S THESIS *Credit, 10.*

900. DOCTORAL DISSERTATION.

The following is a partial list of courses offered by other departments which may be taken for major credit.

AN SCI 706. QUANTITATIVE
INHERITANCE AND
SELECTION.

AN SCI 724. ADVANCED AVIAN
PHYSIOLOGY.

AN SCI 725. MAMMALIAN
REPRODUCTION.

BOTANY 711, 712. ADVANCED
PLANT
PHYSIOLOGY.

BOTANY 721. ADVANCED PLANT
ECOLOGY.

BIOCHEM 726. EXPERIMENTAL
ENZYMOMOLOGY.

BIOCHEM 728. BIOCHEMISTRY OF
PROTEINS.

BIOCHEM 729. ENZYMOMOLOGY.

ENT 803. INSECT EMBRYOLOGY.

ENT 811. INSECT BEHAVIOR.

ENT 814. ADVANCED ANIMAL
ECOLOGY.

MICROBIOL 710. ADVANCED
IMMUNOLOGY.

MICROBIOL 720. MAMMALIAN
VIROLOGY.

MICROBIOL 770. MICROBIOLOGY
GENETICS.

PSYCH 716. ADVANCED
PHYSIOLOGICAL
PSYCHOLOGY.

COURSES OPEN TO BOTH GRADUATE
AND UNDERGRADUATE STUDENTS
(For either major or minor credit)

521 (I), (II). COMPARATIVE
VERTEBRATE
ANATOMY.

Structure and phylogeny of vertebrates. Laboratory work illustrates evolutionary trends and specializations and provides experience in dissection.

Two class hours, one 3-hour laboratory period.

Prerequisite, Zool 101 or 540.

Credit, 3. Mr. Bartlett, Mr. Klingener.

523 (I), (II), HISTOLOGY.

Structure of cells, tissues and organs as related to function, with emphasis on the mammal; introduction to microtechnique. Two class hours, one 3-hour laboratory period.

Prerequisite, Zool 101 or 540.

Credit, 3. Mr. Potswald, Mrs. Rollason.

527 (II). EMBRYOLOGY.

A survey of embryonic development from a combined descriptive, comparative and analytical point of view. Laboratories deal with descriptive and comparative phases of ontogeny, especially of amphibians, birds and mammals.

Two class hours, one 3-hour laboratory period.

Prerequisite, Zool 101 or 540.

Credit, 3. Mr. Kato.

540 (I), (II). PRINCIPLES OF
GENETICS.

Mechanisms of heredity in plants and animals, emphasizing transmission and action of genes, population genetics, and evolution. Three class hours.

Prerequisites, Chemistry 111 and one semester of biological science.

Credit, 3. Mr. Rauch, Mrs. Shepard,
Miss Stroup, Mr. Webster.

546 (I). POPULATION GENETICS.

Distribution of genes and genotypes within species, emphasizing theoretical models of static and evolving natural populations. Observational and experimental data considered, where available.

Three class hours.

Prerequisites, Zool 540 and Math 123 or 135.

Credit, 3. Mr. Mange.

575 (II). BIOLOGY OF PROTOZOA.

Morphology and physiology of Protozoa, with emphasis on the contributions made to basic problems of biology through study of these organisms.

One class hour, one 2-hour and one 3-hour laboratory period.

Prerequisites, Zool 101 or 540, two additional laboratory courses in biological science and Chem 262.

(Not offered in 1970-71)

Credit, 3. Mr. Honigberg.

581 (II). BIOLOGY OF LOWER
INVERTEBRATES.

Survey of invertebrate animals based upon evolutionary and phylogenetic considerations. Includes the Protozoa, Porifera, Cnidaria, Platyhelminthes, Nematoda, Mollusca, etc.

Two class hours, one 3-hour laboratory.

Prerequisites, Zool 101 or 540.

Credit, 3. Mr. Nutting,
Mr. L. S. Roberts.

582 (I). BIOLOGY OF HIGHER
INVERTEBRATES.

Survey of invertebrate animals based upon evolutionary and phylogenetic considerations. Includes the Annelida, Arthropoda, Ectoprocta, Echinodermata, etc.

Two class hours, one 3-hour laboratory.

Prerequisites, Zool 101 or 540.

Credit, 3. Mr. Nutting, Mr. L. S. Roberts.

583 (I). GENERAL
PARASITOLOGY.

Morphology, life cycles, and physiology of protozoan and helminth parasites, with emphasis on broad aspects of parasitism.

Two class hours, one 3-hour laboratory period.

Prerequisites, Zool 101 or 540, Chem 112 or 114.

Credit, 3. Mr. Honigberg.

600 (I). VERTEBRATE ZOOLOGY.

History, relationships, patterns of distribution, classification of vertebrates, with emphasis on fishes.

One class hour, two 2-hour laboratory periods, field trips.

Prerequisite, Zool 101 or 540.

Credit, 3. Mr. Andrews.

602 (II). ICHTHYOLOGY.

Morphology, ecology and relationships of fishes, and their distribution in space and time.

Two class hours, one 3-hour laboratory period.

Prerequisite, Zool 521 or 600.

Credit, 3. Mr. Andrews.

606 (II). ORNITHOLOGY.

Avian biology including structural and functional adaptations, with emphasis on behavioral patterns. Laboratory includes field trips. Two class hours, one 3-hour laboratory period.

Prerequisite, Zool 101 or 540.

Credit, 3. Mr. Bartlett, Mr. Sargent.

608 (II). MAMMALOLOGY.

Evolution, distribution, classification and ecology of mammals. Laboratory includes field trips, preparation of study material, and identification of local fauna.

Two class hours, one 3-hour laboratory period.

Prerequisites, Zool 521 or 600.

Credit, 3. Mr. Snyder.

635 (II). LIMNOLOGY.

Inland waters, including geological, physical, chemical and biological aspects.

Two class hours, one 3-hour laboratory of field trip.

Prerequisites, Bot 100, Zool 101, Chem 112, Phys 103.

Credit, 3. Mr. Ludlam.

637 (I). ECOLOGY.

Introduction to descriptive and theoretical ecosystems, community, population, and behavioral ecology. Laboratory emphasizes ecologic principles and techniques.

Two class hours, one 3-hour laboratory period.

Prerequisites, Zool 101 or 540, Math 124, one semester of invertebrate zoology, preferably Zool 282. *Credit*, 3. Mr. Ludlam.

650 (I). ANIMAL BEHAVIOR.

The biological bases of animal behavior, with an analysis of the methods and objectives of current research.

Three class hours.

Prerequisites, Zool 101 or 540 and Psych 101; or Psych 215.

Credit, 3. Mr. Sargent.

660 (I), (II). GENERAL AND
CELLULAR
PHYSIOLOGY.

Modern trends in physiology with emphasis on the chemical and physical properties of cells, including cell ultrastructure and metabolism, permeability, muscle contraction and molecular biology.

Three class hours, 3-hour laboratory period.

Prerequisites, one year biology and organic chemistry.

Credit, 4. Mr. Kaulenas, Mr. Kunkel,
Mr. Moner, Mr. Searcy.

666 (I). VERTEBRATE
PHYSIOLOGY.

Function of organs and organ systems in vertebrates.

Three class hours, one 3-hour laboratory period.

Prerequisite, Zool 660 or Chem 520 or 523.

Credit, 4. Mr. Snedecor.

670 (II). COMPARATIVE
PHYSIOLOGY.

Physiological principles involved in adaptations of animals to their environment; emphasis in the laboratory on experimental methods used to study adaptive mechanisms.

Three class hours, one 3-hour laboratory period.

Prerequisite, Zool 660.

Credit, 4. Mr. J. L. Roberts.

680 (I), (II). DEVELOPMENTAL
BIOLOGY.

Lectures emphasize physiological and biochemical aspects of development. Laboratory period used for demonstrations, discussions and literature reviews.

Two class hours, one 3-hour laboratory period.

Prerequisite, Zool 660.

Credit, 3. Mr. Kaulenas,
Mr. Kato, Mr. Kunkel.

The following is a partial list of courses offered in other departments which may be taken for major credit.

AN SCI 521. PHYSIOLOGY OF
REPRODUCTION.

BOTANY 521. PLANT ECOLOGY.

BOTANY 611. DEVELOPMENTAL
PLANT CYTOLOGY.

BIOCHEM 523, 524. GENERAL
BIOCHEMISTRY.

CHEM 544. RADIOCHEMISTRY.

CHEM 581, 582. ELEMENTARY
PHYSICAL
CHEMISTRY.

GEOL 540. INVERTEBRATE
PALEONTOLOGY.

MICROBIOL 550. GENERAL
MICROBIOLOGY.

MICROBIOL 610. IMMUNOLOGY.

MICROBIOL 620. VIROLOGY.

PSYCH 515. PHYSIOLOGICAL
PSYCHOLOGY.

International Agricultural Studies

(Interdepartmental)

This program supplements professional career training in the several agricultural disciplines with courses and experience

designed to prepare the student for work with world agricultural development and trade. Specific course programs and research projects are individually developed according to the student's career interest and academic background. Information may be obtained from the Director of Center for International Agricultural Studies, College of Agriculture, Stockbridge Hall, University of Massachusetts, Amherst, Massachusetts 01002.

Index

Accounting	79	General Business and Finance	80
Administrative Officers	8	General Information	11
Admission	18	Genetics	55
Acro-Space Engineering	211	Geology	147
Agricultural & Food Economics	50	Germanic Languages and Literatures	153
Agricultural Engineering	52	Government	158
Animal Science	54	Grade Requirements	44
Anthropology	57	Graduate Assistantships	27
Art	61	Guidance Committee: Ph.D.	31
Assistantships	27	Health Services	47
Astronomy	64	Hispanic Languages and Literature	165
Biochemistry	67	History	168
Botany	69	Home Economics	179
Business Administration	73	Housing	25
Calendar	4	Human Development	182
Certificate of Advanced Graduate Study	30	Industrial Engineering	184
Chemical Engineering	86	Industrial Microbiology	137
Chemistry	90	International Agricultural Studies	299
Civil Engineering	97	Italian	189
Classics	104	Labor Studies	189
Comparative Literature	105	Landscape Architecture	194
Computer Science	107	Language Examinations	43
Computing Center	12	Library	11
Continuing Education	30	Linguistics	196
Course Changes	45	Literature, Comparative	105
Courses Offered	49	Loans (NDEA)	28
Degrees, Requirements	31	Major Offerings	29
Description of Courses	49	Management	82
Dissertation, Doctoral	35	Marine Sciences	198
Doctoral Programs	29	Marine Station	14
Economics	110	Marketing	82
Education	117	Master's Program	29
Electrical Engineering	119	Master's Thesis	42
English	127	Mathematics	200
Entomology	131	Mechanical Engineering	210
Environmental Engineering	135	Microbiology	217
Environmental Sciences	164	Microfilming	36
Examinations		Military & Air Science	14
Foreign Languages	43	Music	219
Expenses	21	Nursing	222
Fees	21	Nutrition and Food	224
Fellowships	27	Ocean Engineering	225
Finance	80	Philosophy	234
Financial Aid	27, 48	Physical Education	240
Fisheries Biology	290	Physics	243
Five-College Coop. Ph.D.	34	Placement Service	48
Food Science and Technology	136	Plant Pathology	249
Forestry and Wood Technology	140	Plant and Soil Sciences	251
Freiburg Program	15	Polymer Science and Engineering	254
French	144	Programs Abroad	15
		Programs Offered	29
		Provisional Students	20

Psychology	257	Special Students	20
Public Health	267	Speech	283
		Statistics	207
Regional Planning	272	Summer Courses	47
Regulations, General	44		
Requirements:		Teaching Assistants	27
<i>Doctoral Degrees</i>	31	Thesis, Requirements and	
<i>Master's Degrees</i>	38	Specifications	35
Research Assistants	27	Trustees	7
Residence, Certificate of	21	Tuition and Fees	21
Romance Languages			
(See French and Spanish)		University, The	11
ROTC (Military and Air Science)	14	Veterinary Science	290
Slavic Languages and Literature	274	Wildlife and Fisheries Biology	290
Sociology	276	Wood Technology	142
Spanish	165		
Special Services	47	Zoology	292



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the University

OTHER CAMPUSES AT BOSTON AND WORCESTER

VOL. LXII, NO. 10

UNIVERSITY OF MASSACHUSETTS BULLETIN

DECEMBER 1970



Dr. John W. Lederle, UMass President for 10 years, rests chin on hand as he listens to his successor Robert C. Wood accept the responsibilities of the 17th President of the University. Also on platform during installation ceremonies at Boston are, from the left, Amherst Chancellor Oswald Tippo, Dr. Lederle, Harvard sociologist and friend of the University David Riesman, and Michael Ventresca, President of the UMass Boston Alumni Association.

New President Sees Many Roads to Excellence

Robert C. Wood has been installed as 17th President of the University of Massachusetts. And so a new administration begins a new era with a President who believes the University may achieve excellence in many ways, train more students for careers, and use its knowledge to improve the Commonwealth of Massachusetts.

Ceremonies were Dec. 9 and began in Boston with a formal installation in which Chairman of the Board Joseph P. Healey administered the oath of office and presented the Presidential medallion to Dr. Wood. The President and dignitaries from each campus and the state then traveled to Worcester, and then to the Amherst campus — with Dr. Wood speaking at each place.

"Elementary and secondary schools, community colleges, state colleges, and the University compete for state appropriations," he noted in his installation address in Boston. "This competition can be healthy in some respects. It can also be divisive and weakening. It can cause us to lose sight of shared goals: to collectively provide the best possible education for the greatest possible number; to foster quality research; and to serve the public needs. . . . Much, much

more needs to be done between public and private colleges and universities to share facilities, people and ideas."

"Within this University," said the President, "it is important for each campus to find its particular identity and contribution. And even on a single campus, I would favor great latitude for individual preference as to program content and learning schedules." He stressed the "variety of valid tasks" to be performed by higher education.

Another of Dr. Wood's beliefs, he said, is that in addition to the traditional university training for graduate work, UMass should provide students with training for careers which do not depend on graduate degrees. This is important, he said, because, "Seventy-five percent of our students come from families earning less than \$15,000 a year; at least half are the first generation in their families to go to college. Only half can depend on family funds to finance their education, and the rest depend on employment, personal savings, loans and scholarships. These students are in school at some sacrifice and they are there — at least in large part — to expand their career choices and their job opportunities."

"Too many," he said, "work toward bachelor degrees to discover that that degree in their field 'just isn't worth much on the job market.'" President Wood suggested improvement in counseling for students.

Another University function concerning the President is service. "The knowledge and skills that exist in this University are one of the state's great natural resources. The Commonwealth has a right to that knowledge and to these skills. They represent opportunities to bring about not only incremental improvements in the environment, but institutional change."

In Worcester, his talk pointed to a need being filled by the new UMass Medical School — a need to train "enough" physicians of higher quality that this state deserves." For the 16 openings at the school this year, he said, the University received applications from 300 state residents.

As for the University's place in the world, Dr. Wood said: "I would have it use its skills, and I would have it use its efforts where they are effective to help other institutions receptive to change to improve by our knowledge, and by our energy, and by our youthfulness. But I would not promise miracles."

Studying The UMass Future



Greetings were extended throughout the day as UMass President Robert C. Wood and Mrs. Wood stood with other dignitaries to receive guests at Boston, Worcester, and Amherst. Here they meet well-wishers at the Campus Center on the Amherst campus. From the left, Mrs. Tippo, Mrs. Wood, President Wood, Chancellor Oswald Tippo.

CCEBS Receives Another Grant

A \$150,000 Ford Foundation grant to the University's CCEBS program was announced by President Wood in his remarks at the Amherst campus following his installation as 17th President earlier in the day.

CCEBS (Committee for the Collegiate Education of Black Students) helps students from "disadvantaged" backgrounds attend UMass.

Programs similar to CCEBS, Dr. Wood said, should be established throughout the University system to give financial and academic aid to "so-called disadvantaged" students, black and white.

Repeating his commitment to encourage students from such backgrounds to seek higher education, Dr. Wood praised the program and said the University would "undertake to continue, improve, and ac-

celerate the CCEBS program." He added, "I think that that program marks the beginning of one of the great advances of this country, and of this University in this country."

The Ford Foundation has contributed a total of \$448,000 in previous grants to the three-year-old program, the Student Senate has contributed \$30,000 each of the three years, and the State Legislature has appropriated \$750,000.

Published eleven times a year by the University of Massachusetts in February, March (3), June, August (2), September, November and December (2). Second class postage paid at Amherst, Massachusetts 01002 and at additional mailing offices.

The future of this 107-year-old "youthful university" will be studied by a special committee appointed by President Robert C. Wood the day of his installation.

Announcing his Committee on the Future University, the new President called UMass a "youthful university" because its Medical School in Worcester is training its first 16 doctors, its Boston campus has just broken ground at Columbia Point, and the Amherst campus "is growing like an adolescent."

Vernon Alden, chairman of the board of the Boston Company and former president of Ohio University, will chair the special President's Committee which will include representatives of the students and faculties of the three campuses, the alumni, the public, labor and business, the professions, and the academic community in and out of the state. Committee staff director will be Peter Edelman of Washington, D.C., former clerk of the U.S. Supreme Court and former legislative assistant to Sen. Robert F. Kennedy.

Dr. Wood's description of the committee's function: "The committee will listen to those who know this University best — the students, the faculties, the deans. They will listen to our legislators and citizens who have a just concern with how the Commonwealth educates its children. They will explore new ideas now floating around the educational community and identify the ones on which we should be working. I intend to listen to the committee members as well as with them, and I am deeply grateful they are willing to take on this assignment. The responsibility for considering and acting on their recommendations rests, as always, with the Trustees. But the Trustees' action can be based in the critical times ahead on the best possible information and analysis."

Trustees began discussing the future of the University at a special two-day policy review during the holiday vacation.

Changes in UMass campus life should be systematic, according to the new President. He noted that recent changes have been generally "entirely sensible and probably overdue," and not sufficient. He added, "But most of the changes that have resulted from turmoil and agitation of the past few years — not only at this University but across the country — are largely marginal and incremental: A pass-fail option, a few urban courses, a black studies program." The more systematic changes he envisions should involve the answers to these four questions he posed Dec. 9:

"How do we build the public university of the future and not the public university of the 1950s?"

"What should the future university teach?"

"How should we organize the university and its resources?"

"What should it look like?"

Said President Wood, "If we don't try consciously to shape the University's future, the pressures of growth will shape it for us."

Fine Arts Center Is Begun

The center of campus is undergoing another major change these days as crews prepare a site for the \$15-million Fine Arts Center which will open in fall, 1973.

Twenty-four trees at the south end of the Campus Pond are being moved to nearby locations, and a temporary foot-bridge is being constructed so students will be able to cross campus while the building is being constructed within a fenced-off area.

The Fine Arts Center will coordinate the center of campus design and create a main entrance to the campus. It will consist of seven buildings in one with a unifying feature called an art bridge — a 646-foot enclosed bridge containing art studios. Pedestrians will enter the center of campus by walking along a passthrough under the art bridge which with other portions of the Fine Arts Center will form the main entrance to campus.

Once through the entrance, they will see a scenic center of campus designed by planners Sasaki, Dawson, DeMay Associates, Inc., who were insistent upon

establishing a permanent open space area to include the pond.

The sky above the Fine Arts Center will be broken by an irregular line of the many-faceted building. Its several levels and entrances will indicate the several phases of fine arts accommodated by the interior. Music, art, and theatre will have 200,000 gross square feet of space for four auditoriums, 17 classrooms, 75 studios, and 56 faculty offices.

Contained in the building will be a 2,200-seat concert hall, a 700-seat theater for lectures and musical productions, speech offices and classrooms, an art gallery, music department facilities, art department facilities, and a library for music and art.

Kevin Roche, chief designer for Roche and Dinkeloo of Hamden, Conn., and architect of the Fine Arts Center, received the 1965 Arnold W. Brunner Memorial Prize in Architecture from the National Institute of Arts and Letters. The award is given annually to an architect who shows promise of contributing to architecture as an art. It is one of the most coveted awards in architecture.

Dear Parents:

Happy New Year. May 1971 be an especially prosperous and happy time in your lives.

This academic year has been quiet so far, and while students are concerned about the major issues, they are concentrating on their studies.

We are beginning a new UMass-Parents program (described elsewhere in this issue) in an attempt to improve understanding among parents, students, and University administrators. If you can find the time, we hope you will volunteer to attend the planned discussion sessions with the Dean of Students' staff.

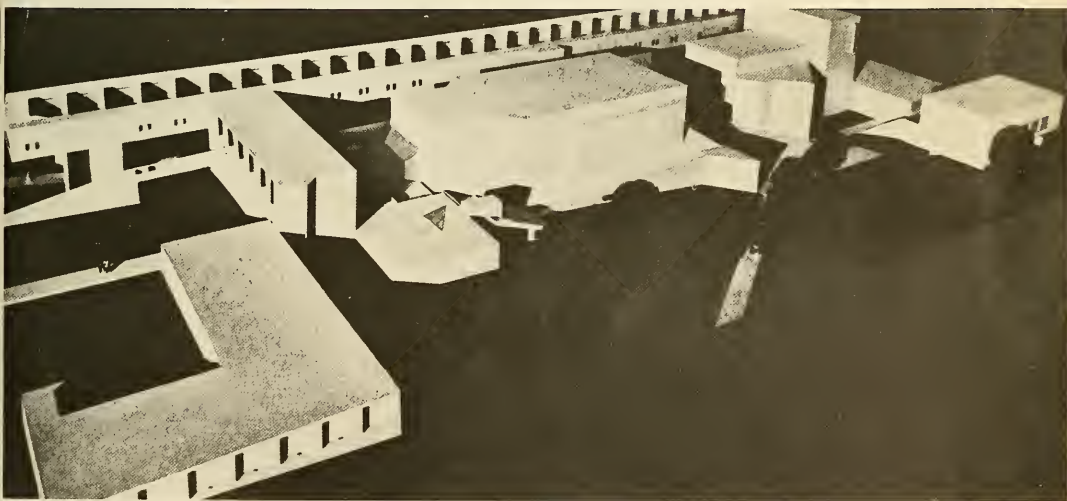
Our Amherst campus begins the new year with more than 19,000 students. Construction continues on an almost completed Graduate Research Center, a 28-story library, a psychology building, and two residence halls. One new residence hall in this residence complex will be open to students for the first time this semester.

As we progress in growth, may we also progress in understanding of each other.

Best wishes for a wonderful new year.

Oswald Tippo

Oswald Tippo, Chancellor



The Fine Arts Center, as it will look from a point between the Campus Pond and North Pleasant Street (the old Route 116) is shown in this architect's model. The reverse L-shaped portion at left corner is the music wing. Next is an art section connected to the horizontal art bridge which will provide a covered walkway for pedestrians. Note the art bridge rectangles which contain slanted windows directing northern light to art studios. In center of photo is the 2,200-seat concert hall. Sections at far right are for the study of theater, with a 750-seat theater next to the concert hall, a 200-seat studio theater extending from that, and speech department classrooms and offices in the foreground.

Parents to Become Involved

Parents will be more involved this year in planning orientation programs for incoming freshmen and transfer students.

A new program of the Dean of Students Office has been designed to improve communication between the University and parents, help students understand problems of their transition to the University, and inform students of opportunities at the University.

Dean of Students William F. Field is looking for UMass parents, whose sons and daughters are now in their first year at the Amherst campus, to aid the University in developing student and parent programs for next year. Some parents have already volunteered, Dean Field said, and they will be contacted about spring meetings to be scheduled for identification of problem areas and finding ways in which parents and the University may work cooperatively to meet them.

Parents who would be willing to take part in any one of the Saturday sessions this spring at the Amherst campus may write to Dean Field at the Dean of Students Office, 227 Whitmore Administration

Building, University of Massachusetts, Amherst, Mass. 01002; or call his office at (413) 545-2685.

First year students entering the University frequently experience problems in the transition. And the University is often unaware of problems which parents may have in understanding the University. Dean Field believes this situation may be helped as a result of these open discussion meetings.

Dean Field has expressed his appreciation to parents who have in letters or calls raised problems or made suggestions to the University. These calls and letters have brought about the idea for a continuing series of discussions with concerned parents to aid in planning summer and transfer orientation programs and to develop a program of improved parent communication. What the program needs now is interested parent volunteers.

Financial Aid Applications Ready

Student financial aid applications are available and must be filed by March 1 for students to be considered for scholarships, grants, loans, and work-study programs.

The applications will be for summer, 1971, and for the 1971-72 academic year.

This University-sponsored aid program is directed to upperclassmen and graduate students. Students who are receiving aid this year and wish to be considered for next academic year must file new applications.

Forms may be picked up at the Office of Placement and Financial Aid Services, 239 Whitmore Administration Building.



An open door welcomes Mr. and Mrs. Thomas J. McKay to their new apartment in newly opened North Village, modular housing for married students. So far, 72 couples have moved into the 240 one and two bedroom apartments. Mr. McKay is a candidate for a Ph.D. degree in philosophy and his wife, Ruth, is a part-time English student.

**UNIVERSITY OF MASSACHUSETTS BULLETIN
AMHERST, MASSACHUSETTS 01002**

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**PARENTS NEWSLETTER
FOR PARENTS AND FRIENDS
OF THE UNIVERSITY**

UNIVERSITY OF MASSACHUSETTS BULLETIN

1960-1970

A Dynamic Decade

VOLUME LXII
DECEMBER 1970
NUMBER 11

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PARTIALLY PRINTED WITH PRIVATE FUNDS

*A
Brief
Glimpse
of Growth
and Progress
at the University
of Massachusetts at
Amherst, Boston & Worcester
in the Dynamic Decade 1960-1970*

THE ANNUAL REPORT OF THE PRESIDENT
FOR 1969 – 1970





June 17, 1969

Mr. Joseph P. Healey, Chairman
Board of Trustees — University of Massachusetts
14 Winchester Road
Arlington, Massachusetts 02174

Dear Mr. Healey:

When I came to the University of Massachusetts in 1960 I set for myself ten years as the outside limit of my tenure in presidential office. I have always felt that a president makes his major contribution within his first ten years. Although there are some tasks that remain to be done, after ten years it is better that a board of trustees select a new man, one who can bring new ideas and suggest different educational paths for a university as called for in a day of dynamic social change.

For some time past I have been the senior state university president in New England. I have already held office longer than the national norm. If I may indulge in some humor currently prevalent among my presidential colleagues: "It is a good idea to quit before one falls farther behind."

I therefore write to apprise you, and through you the Board of Trustees, of my resignation as President to become effective at the end of the academic year 1969-70. I give you this notice now so that you may have ample time in which to search for my successor. Pending his arrival I shall, of course, devote my full attention and energy to the advancement of the University system in Amherst, Boston and Worcester.

My decision is based on my firm belief in what is good for the University. I resign with the highest regard for the members of the Board of Trustees and with deep appreciation for the privilege they have afforded me to lead the University during this period of rapid growth not only in size but in quality. It is hard to realize that enrollment has increased from slightly more than six thousand students in 1960 to a planned twenty-one thousand next fall.

As I have said many times, "The University is people!" In the popular mind the President gets the credit, but the truth is that any success we have achieved is due to the backing of an outstanding faculty and of a dedicated group of administrators who have worked ably as my administrative team. If there is any discredit, as President I am glad to assume that alone.

One of my great satisfactions and challenges as President has been the opportunity to work both in Boston and in Amherst with outstanding and responsible students. The University has pioneered in the involvement of students in the development of policy at all levels clear up to the Board of Trustees. We have established and will continue to develop a tripartite academic community in which students, faculty and administration work cooperatively toward the common goal of academic excellence.

I have been grateful as President for the hand of friendship extended by governors, state legislators, and state house administrators. Although our budget requests have frequently been cut and we have not received the kind of financial support which would put us in the forefront of public institutions, we have made tremendous progress. It is only because the Commonwealth started from such a low base that the very real effort of recent years has been obscured.



I would be remiss if I did not express my grave concern for the thousands of qualified applicants we must turn away each year. Without greatly increased financial support for public higher education—community colleges, technical institutes, state colleges and the University—thousands of Massachusetts youth will find the door to college slammed shut in the years just ahead, and our greatest natural resource will be lost to us.

When I leave the presidency next year I should like to return to my professional field of political science in a faculty position where I can teach and do research. This will also permit closer contact with students which I have missed. I shall continue to promote the University's welfare, albeit in a different role. I look forward to the day when the University will be truly recognized as the "People's University," and I will continue to support the Board of Trustees in bringing this dream to fruition on behalf of the youth of the Commonwealth.

Sincerely,

JOHN W. LEDERLE
President

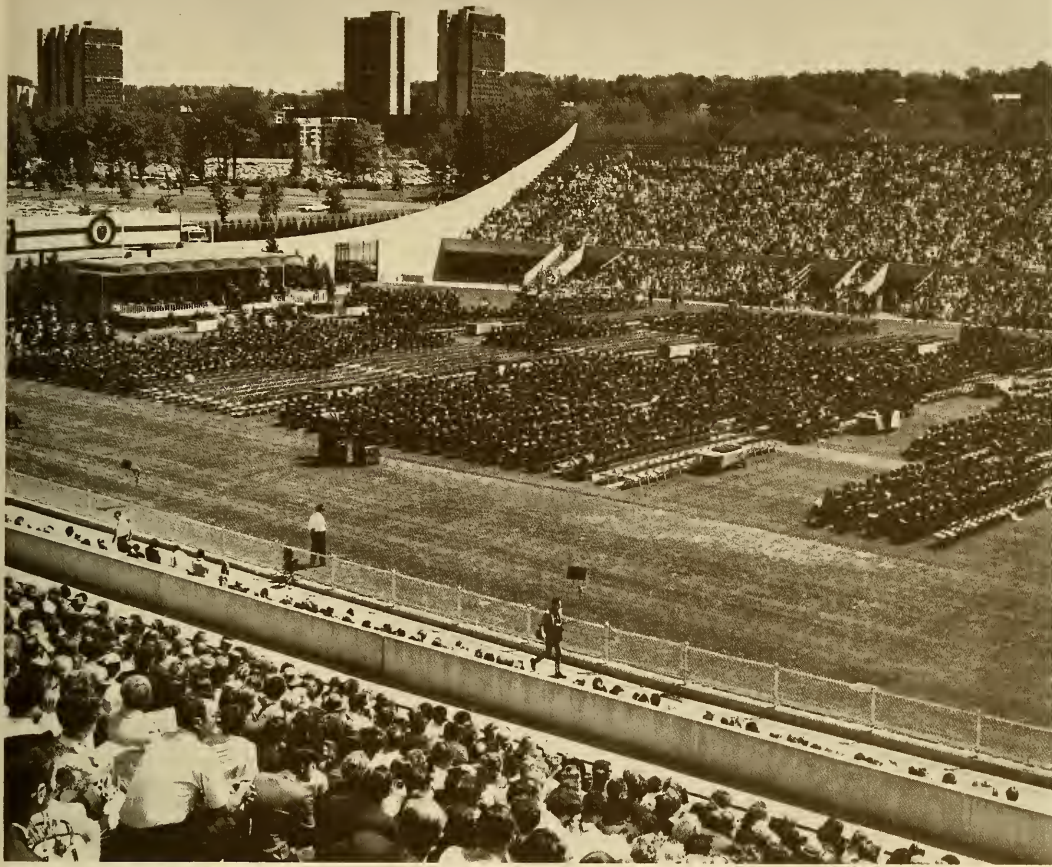


WITHOUT QUESTION, growth has been the dominant characteristic of John Lederle's presidency at the University of Massachusetts. Since 1960, President Lederle has directed an uncommonly impressive expansion of the Commonwealth's university: enrollments have more than tripled; physical plant has increased manifold; what he took over on a single campus now has three locations. Furthermore, most of these increases resulted from new developments, not from taking over existing projects. While such growth in the University of Massachusetts was necessary and apparent, it was John Lederle who carried it out and continued to remind us all how needed it was.

It would be a serious mistake, however, to assume that the growth which has taken place over the last decade has been in size only. President Lederle has managed a growth in the University's quality which is equally impressive. Doctoral programs multiplied, both building upon and building improvements within faculty. Faculty recruitment has been organized—successfully—on a nationwide basis. Grants for research have grown enormously; the number and variety of agencies which give them have expanded significantly.

In a word, President Lederle has brought the University of Massachusetts to the threshold of unquestioned excellence. This is a very large and very significant accomplishment. He has earned—and deserves—our heartiest thanks.

THE HONORABLE FRANCIS W. SARGENT
Governor of the Commonwealth of Massachusetts



JOHN W. LEDERLE DOCTOR OF LAWS

No one can place true value on a decade of days devoted to building a major university.

Under your leadership this institution has tripled enrollment, built seventy new buildings, added two campuses, and joined the front rank of America's institutions of public higher education.

Overriding the physical monuments to your presidency have been your constant faith in students, your commitment to good teaching and your continual advocacy of quality, low-cost public higher education for the youth of Massachusetts.

For the thousands of men and women who have been graduated from this University during your tenure, and for those yet to come, we thank you. The Lederle years will now be recorded in the history of this University as its finest decade.

I, therefore, by authority of the Board of Trustees of the University of Massachusetts, confer upon you the degree of Doctor of Laws, honoris causa, and admit you to all its rights and privileges. In token of this I present you with this diploma and invest you with the appropriate hood.

Given at Amherst, Massachusetts
May 30, 1970

JOSEPH P. HEALEY
Chairman
Board of Trustees



Intellectual interchange between faculty member and individual student continues to be stressed.

Viewing balloon-borne telescope at 1968 opening of astronomy laboratory are Dr. John D. Strong, then-Provost Oswald Tippo, and President Lederle.



DURING ITS COURSE, the decade of 1960–1970 for the University of Massachusetts was difficult and demanding. In retrospect, it was a spectacular success story.

From the Fall of 1960, when John W. Lederle took over the presidency from Jean Paul Mather, until the Summer of 1970, when he relinquished it to Robert C. Wood, the University of Massachusetts passed through what might be termed an institutional adolescence. It was altered in many vital ways, passing from small to large, from one campus to three, from its first to its second century, and from adequacy to excellence. Accompanying this text are selected comments made by Dr. Lederle as the early years of the decade unfolded.

The decade saw the size of the University virtually explode. Student enrollments tripled, the number of faculty, the total operating budget, and the number of books in the library quadrupled. The century-old Amherst campus was joined by campuses in Boston and Worcester. Painfully small faculty salaries and the number of advanced degree fields were doubled. Undergraduate, research and service programs grew in number and scope.

At the same time, the University struggled successfully for legislation granting a measure of fiscal autonomy, an approach to a state-wide system, and sufficient faculty salary relief to begin national recruitment. And through it all ran the unavoidable stresses inherent in juxtaposing an immutable concern for the individual student with gigantic growing pains and the advance of computer technology.

As the University of Massachusetts grew to maturity, its aims broadened, its purview enlarged, and its outreach extended. Successive challenges and problems were transformed by time and effort into opportunities and successes. It was a decade of which Massachusetts' citizens can be proud.

The Sixties opened for the University of Massachusetts with an increased thrust for legislative and citizen support, coupled with an internal drive for qualitative improvement. New entrance requirements became effective, an Honors Program was initiated, and interdisciplinary sophomore colloquia established. The programs in Nursing

“ . . . these are exciting times for higher education on every campus; but for sheer excitement due to dynamic change, the University has few, if any, rivals. We are in many ways pioneers, and pioneering is always exciting.” (1961)

“As educators, we should all have but one aim—and that is to make the University of Massachusetts the finest state university in the country. We don't want to make it a mere copy of the University of California, or of Wisconsin, Minnesota or Illinois. Let us not be afraid to copy good ideas, but let us also apply our best talents to innovation, to experimentation—to building the University of Massachusetts as an institution having its own integrity and identity.” (1963)

“When one contemplates our rate of expansion in the next three or four years it is clear that the gears of our complex machine will frequently clash. For the number of students who are in the University this year, we have adequate classrooms but inadequate dormitories. We have a plenitude of scientific laboratories in Morrill Hall but major needs in other areas. We have a beautiful Student Union, only four years old, but it is already far too small for our student body. We have plenty of bookshelves in our new library addition, but purchasing and cataloging books so that they will be available to



Board of Trustees, Organization of 1963: seated from left: Robert D. Gordon, representing Governor Peabody; Most Reverend Christopher J. Weldon; Harry C. Solomon; Alfred L. Frechette; Fred C. Emerson; Joseph P. Healey; Dean Leo F. Redfern; Chrm. Frank L. Boyden; Pres. John W. Lederle; Alden C. Brett; John W. Haigis; George L. Pumphret; Calvin H. Plimpton; Edmund J. Croce; Hugh Thompson; Harry D. Brown; Frederick S. Troy.

Seated at left, behind table: Owen B. Kiernan; Dennis M. Crowley. Standing (l. to r.): Gilbert L. Woodside, Provost; Charles H. McNamara; and Kenneth W. Johnson, Treasurer. Members of the Board not shown: Mrs. Kathryn F. Furcolo, Miss Victoria Schuck, Ernest Hoftzyer, and J. John Fox.

Chatting informally with President Lederle in his office are students Sara Vartanian, Millbury, Shawn Fitzgerald, North Easton, and Paul Mankowsky, Millers Falls.



and Physical Education were formally established as Schools, and the new Four College Cooperative Ph.D. degree was authorized. The Student Health Services were reorganized as a new infirmary was being built. The Hampshire Inter-Library Center was transferred from Mount Holyoke College to the University, which had just doubled its library space.

During these visible improvements, the new fifteenth president of the University began working to bring together a new and efficient administrative team. The second year of his tenure saw appointment of Dr. I. Moyer Hunsberger as Dean of the College of Arts and Sciences, of Dr. William F. Field as Dean of Students, and of Dr. Leo Redfern, initially as Director of the newly-created Office of Institutional Studies.

Established in 1961 were the Research Computing Center, the Population Research Institute, and the Polymer Research Institute. The Bureau of Government Research aided in establishment of the Massachusetts League of Cities and Towns, and the School of Education began study of the subsequently successful plan to establish a girls' school in Uganda with Federal assistance. Dr. Arless A. Spielman became Dean of the College of Agriculture and Director of the Experiment Station.

Spadework was begun in depth in 1961 by President Lederle for what is generally considered to have been the most vital single aspect of the institution's subsequent growth—fiscal autonomy. Close working relationships were being built with key members of the Legislature; the press and public were made aware of the issue through the 1961 Annual Report of the President, and strong organized efforts were launched by such groups as the University Alumni and the Massachusetts League of Women Voters.

A Special Commission on Budgetary Powers, established through efforts of Senate Majority Leader Maurice Donahue, made recommendations supporting the University's stand that it should be granted fiscal authority commensurate with responsibility. Effective support was also given by Dr. Frank L. Boyden, chairman of the University's Board of Trustees, and the presidents of the private

readers cannot be accomplished simply by legislative appropriation. Given positive attitudes, however, rather than non-constructive negativism, we shall reach our goal.” (1961)

“... Education is our greatest national resource. If we fail to tax ourselves to exploit its potential, because we prefer tail fins on our automobiles and new frost-free refrigerators in our kitchen when the old ones work pretty well, we may see the day when we have neither automobiles or refrigerators.” (1961)

“Students, let us never forget, are the main raw material of a university. Their individual growth and development are and should be the prime focus of the entire educational enterprise. Let the University of Massachusetts continue to emphasize good teaching. Let us find and reward the good teacher.” (1961)

“The University of Massachusetts is deeply concerned about stimulating its students to take an active interest in the problems of local, state and national government. Rousseau warned: ‘As soon as any man says of the affairs of state: What does it matter to me? the state is lost.’

“In order that our students may understand why the state must always matter, we bring to our faculty scholars

The Medical School Site — Worcester





Model of the planned teaching hospital at Worcester is viewed by President Lederle and Dr. Lamar Soutter, Medical School Dean.



Historic signing of Fiscal Autonomy Bill by Gov. John Volpe is witnessed by Senate Pres. John Powers, House Speaker John Thompson, Senate Majority Leader Maurice Donahue, President Lederle and Dr. Frank Boyden, chairman of the Board of Trustees.



First recipient of the Distinguished Teacher of the Year Award (1962), Dr. William H. Ross bears University Mace at Commencement.

colleges and universities in the Commonwealth. The front lines of the University's thrust toward implementing fiscal autonomy were manned by Dr. Redfern, Business Manager Gerald Grady, Treasurer Kenneth Johnson and Provost Gilbert Woodside.

The fiscal autonomy bill, as passed in 1962, gave authorization to the Trustees to set professional staff salary ranges within state salary schedules, to modernize purchasing and printing procedures, to establish rules for tenure, to transfer funds within state subsidiary accounts, and to set up internal trust funds.

The University's Centennial Year, 1962–1963, also witnessed major progress along two other important paths—the establishment by statute of a University of Massachusetts Medical School, and the bringing of faculty salaries more closely in line with the AAUP scale through a 20 percent salary increase, the latter achieved the following year. In line with Dr. Lederle's stress on rewards for faculty excellence, the first Distinguished Teacher of the Year Award was presented.

The same year, first plans were made for a new Fine Arts Center, only this year ready for bid, and the University of Massachusetts Press was born. Dr. Edward C. Moore became Dean of the Graduate School. First principles of what was to become the state-wide University system were published in the University's Long Range Planning Report, which also foresaw a division of continuing education, implemented during Dr. Lederle's final year.

Four major appointments in 1963–64 rounded out the Lederle administration team. Dr. Oswald Tippo was named Provost, Robert J. McCartney became Secretary of the University and Director of University Relations, and Dr. William Tunis was appointed Dean of Admissions and Records. All three were University alumni. In the fourth shift, Dr. Redfern was named to the new post of Dean of Administration. Major administrative efforts were mounted to support the concepts of a state-wide University system, and development of a University of Massachusetts campus in Boston. Dr. Lamar Soutter was named Dean of the Medical School. In Amherst, the first experimentation with the successful residential college program was

who are expert in the field of parties and politics. Yet we don't leave this merely to be studied out of books under scholarly guidance. We also bring to our campus for extended periods of time noted practical politicians and distinguished exponents of statesmanship. We abhor the widely held view that politics is a dirty business. Through direct personal contact, we find that our students learn to appreciate and to honor the role of the politician as he works out the compromises so vital to continuation of democratic government.” (1961)

“Certainly in New England, excellence in higher education has meant, by and large, our distinguished private institutions. Theirs is the long, noble and continuing tradition. But we in the public institutions find that the tide of population is increasingly sweeping us toward the forefront of educational activity. And we find more and more evidence, often submitted by the private institutions themselves, that if New England—and indeed America—is to rise to new heights of educational service for most of its people, then assuredly most of the people must turn to the public institutions for such service.” (1961)

“. . . We must not content ourselves with aiming at the average. I recognize that it is costly to minister to needs



Presidents of the six New England state universities, gathered in 1969, are (from left): Werner Baum, Rhode Island; Homer D. Babbidge, Jr., Connecticut; John W. McConnell, New Hampshire; Winthrop C. Libby, Maine; Lyman S. Rowell, Vermont, and John W. Lederle, Massachusetts.

A visible sign of growth — awesome stacks of textbooks for each semester.





The Andover Campus 1970 - Looking West

New Facilities

Construction and Acquisition

1960

Basement Hall 2,181,000
Morrill Science Center I 1,981,000
Dickinson Hall ROTC 478,100
Maintenance Physical Plant 8,700,000
Gridwell Library Addition 1,940,000
Ingram House 586,500
Hills House 1,388,500

1961

Addition Worcester Dining Commons 504,475

1962

Marx & Meadlow Lab School 1,844,000
Morrill Science Center II 1,452,177
Infirmary 961,450
Cold Storage 641,191
Engineering & Physics Labs & Classroom 662,187

1963

Hodsworth Hall 1,213,340
School of Business Administration 1,412,001
Hastbrook Laboratory Addition 1,990,019
Boyd Gymnasium 2,118,112
Gorman House 1,019,478
Brent House 773,200

1965

Mahar Auditorium 231,117
Observatory 10,000
Mobile Classroom 5 @ \$8,285 41,325
Orlyle Greenhouse 18,664
Rite 231,764
Richard Hill Residential College (Grayson Dickinson Field & Webster Houses) 4,631,927
Franklin Dining Hall 1,452,964

1966

Engineering Building East 1,340,133
Chandover Laboratory Addition 1,372,637
Morrill Science Center IV 3,473,355
Cost Handling Facilities 231,764
Stadium & Facilities Building (Low-Rise Residence Halls Southwest) (Thoreau Melville, James & Emerson Houses) 2,699,431
Southwest Residential College Towers (Kennedy Coolidge J. Adams, J. Q. Adams, & Washington Towers) 11,307,100
Hampshire Dining Hall 2,708,000

1967

Sheep Shed 343,393
Thompson Hall 320,700
Hester Hall 2,754,334
Biology Laboratory & Classroom E 2,754,334
Warham 211,000
Water Tank 75,000
Low-Rise Residence Halls Southwest (Cance Pierpont & Moore Houses) 3,800,000
Berkshire Dining Hall 2,080,923

1968

Medical Plant (Administration & Storage) 1,347,804
Chemistry Laboratory 205,000

1969

Tolson Sheep Shed 11,000
Thompson Hall 2,726,640
Hester Hall 3,428,448
Biology Laboratory & Classroom E 211,000
Warham 75,000
Water Tank 3,800,000
Low-Rise Residence Halls Southwest (Cance Pierpont & Moore Houses) 2,080,923
Berkshire Dining Hall 2,080,923

1970

Murray D. Lincoln Campus Center and Parking Garage 16,000,000

Under Construction

Graduate Research Center I 15,000,000
Tobin Hall 5,900,000
University Library 14,500,000
Brown, Cashin & McHamsia Residence Halls 10,500,000
North Village (Married Student Housing) 2,500,000

1971

Total State Funds 71,950,278
Total Building Authority 72,478,703

GRAND TOTAL \$144,428,981

Planned

Graduate Research Center II 11,400,000
Fine Arts Center 13,400,000
Engineering Laboratory Building 18,900,000
Infirmary Addition 1,400,000
Life Science Building 4,000,000
Medical School West 138,000,000
Columbus Plant Campus Boston 155,000,000

Building Authority Projects

The Andover Campus 1970 - Looking West



Enrollments*

1959 - 1969

	Fall 1959	Fall 1969	Percent Increase
Undergraduate	4,911	12,745	160
Stockbridge	327	593	81
Subtotal	5,238	13,338	155
Graduate	635	2,512	296
Total Amherst	5,873	15,850	170
Boston	—	3,517	—
Total University	5,873	19,367	230

*Based on Full-Time Equivalent. Totals by head count rose from 6,131 to 22,462 for the decade, a 266 percent increase.

on a more individual basis, helping each student to achieve the excellence of which he is capable, but anything less means a great loss of those of superior talent and of those of lesser talent. We cannot afford such loss at this stage of our history." (1961)

"Whenever I go to alumni meetings our graduates come up and ask about some of the teachers who influenced them profoundly. Their eyes light up as they remember their idiosyncrasies, their pet phrases, their admonitions, their advice and counsel. I say to the students here today—sometimes the professors they remembered were the ones who seemed too hard and demanding. But in after years they came to realize that this very discipline and exactitude was the lesson they needed most after being brought up to adulthood in an atmosphere of parental permissiveness and teen-age domination." (1962)

Numerical Growth

in

Major Fields of Study

1959 - 1969

	Fall 1959	Fall 1969
Arts and Sciences	24	31
Agriculture	21	19
Business Administration	6	12
Education	2	2
Engineering	5	7
Home Economics	5	5
Nursing	1	1
Physical Education	3	3
Public Health	—	3
Bachelor's Degrees	67	83
Master's Degrees	38	60
Doctorates	12	46
Total Major Degree Fields	117	189

"Instead of talking about corrupt government and corrupt politicians, it is high time we concentrated our talk on the corrupt private citizens who corrupt politicians. Some years ago one of my friends in the legal department of a leading auto manufacturer called me asking for suggestions for a speech the company president was scheduled to give on governmental ethics. I



Pres. Lederle lunches in Washington with Sen. Kennedy, Rep. Conte, and other Congressmen.

Students gathered last spring at Alumni Stadium exemplify new active rather than passive student role in University governance.



Average Faculty Salaries

(Amherst Campus Only)

	Fall 1960	Summer 1970
Professor	\$9,942	\$21,126
Associate Professor	7,636	15,926
Assistant Professor	6,360	12,579
Instructor	5,382	9,468
Average, All Ranks	7,528	15,152
Number of Faculty	315	1,031



Operating Funds Comparison

(All Campuses)

	Fiscal 1960	Fiscal 1970
Total Operating Funds	\$13,065,845	\$107,883,774
State Appropriations	9,476,498	61,186,319
Returned to State Treasurer	3,417,783	6,181,846
Net from State	6,058,715	55,004,473

Capital Outlay Comparison

(All Campuses)

	Fiscal 1960	Fiscal 1970
Total Capital Appropriation	\$ 1,600,000	\$89,800,000*

*Includes special appropriations of \$50,000,000 = new Boston Campus;
\$19,600,000 = Medical School, Worcester.

gave him a number of references and ideas. Then I concluded the conversation by saying that I would have no respect for his president if he focused exclusively on the ethics of public office holders: 'Let him remind his audience that politicians don't bribe each other. Private citizens do the bribing and deserve some of the stigma.' There is too much preaching today about governmental corruption which ignores the non-official participant. Whether in government or private enterprise, venal practice is equally reprehensible. We should be equally vehement in stamping it out.

"Ironically, one way in which we tend to corrupt our public officials, both elected and appointed, is in our failure as a society to see to it that good service is adequately compensated. In a society which has been for over a hundred years industrially oriented to the production of material goods, public service — like public education — has frequently appeared to many to be a luxury or fringe benefit to which little material rewards should be assigned. Thus we have tended to be parsimonious in salaries for public service, while being magnanimous in the high standards of integrity and service demanded of those serving us in a public capacity." (1962)

"A public official must want to communicate. He must

The Changing Face of the Amherst Campus

Aerial photographs of the University's Amherst Campus taken in 1960 (below) and in 1970 (at right) show the decade's sweeping physical changes. Below, looking southwest, Johnson House was under construction (lower left corner), while open fields along upper edge of photo give no hint of high-rise residences to come. At right, view toward northeast shows ten-year expansion, with Southwest Residential College in foreground.





Distinguished Architects For a Decade of Growth

(Listed with Selected Projects)

HIDEO SASAKI of Sasaki, Dawson,
DeMay associates, Master Plan-
ning Consultants to Trustees

PIETRO BELLUSCHI, Architectural
Consultant to Trustees

BREUER & BECKHARD
Campus Center

CAMPBELL, ALDRICH, NULTY
Graduate Research Center

COLETTI BROTHERS
Herter Hall & Tobin Hall

DRUMMEY ROSANE ANDERSON
Engineering Laboratory Build-
ing

GOODY & CLANCY
Infirmary Addition

VINCENT G. KLING & ASSOCIATES
Life Science Building

PER NEYLEN
Married Student Housing

ROCHE & DINKELOO
Fine Arts Center

SKIDMORE, OWINGS & MERRILL
Stadium

EDWARD DURELL STONE
Library

HUGH STUBBINS
Southwest Residence Area

J. C. WARNECKE & ASSOCIATES
Brown, Cashin & McNamara
Residence Halls

PAUL WEIDLINGER
Stadium



Dr. and Mrs. Lederle are flanked by Gov. John A. Volpe and Chrm. George L. Pumphret of the UM Building Authority at dedication of Massachusetts Alumni Stadium in 1966.



A Phi Beta Kappa Chapter was established on the Amherst campus in 1964-65.

Watching the Redmen on the gridiron. Behind Dr. Lederle on either side are Gov. Endicott Peabody and the Governor's mother; beside him are his daughter Pamela and Mrs. Lederle (left).



begun at the new Orchard Hill facility under a Danforth grant, and the first students were admitted under the now-famous swing-shift program, designed by President Lederle to allow full year-round use of University facilities.

A substantial breakthrough on two fronts was made in 1964–65, with enactment by the Legislature of the provisions of the Massachusetts Higher Education Plan, and realization of the plans for the University of Massachusetts at Boston. During that fiscal year, Dr. John Ryan was named the first Chancellor of the University at Boston. Preliminary planning continued for the Medical School in Worcester. Also in 1964, the University began its continuing cooperative agricultural education effort with the African nation of Malawi, under auspices of the Agency for International Development.

Based on the Harrington-Willis Report which the University Trustees had endorsed four months earlier, the Massachusetts Higher Education Plan as passed in June, 1965, set up and defined a state-wide University system, a state college system, and a community college system. These existing segments of Massachusetts' educational enterprise were placed under coordination of a newly created Massachusetts Board of Higher Education, with an Advisory Council on Education appointed by the Governor. Board membership consisted of seven members nominated by the Advisory Council, and one member each from the University's Board of Trustees and the Boards of State Colleges, Community Colleges, and Technical Schools and Institutes. Rigid control was avoided in structuring the new body, while new opportunity was provided for cooperative growth.

New arms for expanded University outreach created at Amherst during 1964–65 included the Labor Relations and Research Center, the Water Resources Research Center, and the Cooperative School Service Council in the School of Education. The same year, the University was elected to national membership in Phi Beta Kappa.

Authorized in June, 1964, the University of Massachusetts at Boston opened its doors to 1200 freshmen in September, 1965. The swift acquisi-

want to go out and see for himself. He must believe that by listening, not just talking, by seeking criticism of his program, not merely corroboration of its efficacy, he will best do his job. There is no place for the thin skinned. Two-way communication is the way of democracy. There must be a constant struggle against ennui, against the temptation to sit in our own offices by day and sleep in our own beds each night. We must not assume that the era of personal attention is over."
(1962)

"Will we become a massive educational machine spewing out graduates according to the best principles of standardized packaging? Will the role of teaching become similar to that of a cog in a machine, performing in non-human fashion a rigidly prescribed function? Or will we somehow preserve the essential humanity that must mark our educational activities if what we purport to admit to college is a human being in the first place?"
(1962)

"As we grow in size, it is important that we understand the prime role of a university . . . This role must be devoted to the individual, to his growth as a thinking and humane being, of intrinsic worth and significance to all society.

"Expansion of our educational community — rapid as it is



Typical of many of the decade's dedications was this in 1969 for Herter Hall. With Pres. Lederle are Mrs. Christian A. Herter and Ambassador J. Graham Parsons, representing the State Department.

Dean of Administration Leo Redfern (left) and Dr. Lederle answer questions posed in Washington in 1967 by Reps. Edward P. Boland and Thomas P. O'Neill, Jr. (right).



tion of the temporary site and facilities, and the excellent faculty and staff, remain one of the notable educational achievements of the decade.

During the second half of the decade, strong emphasis on University relations through news and publications—combined with the massive public awareness generated by the struggles over fiscal autonomy and the Boston and Worcester campuses—created a favorable climate for additional salary legislation and an adequate operating budget despite great pressures for further cuts. And through it all, the University continued to be granted impressive sums in capital outlay for the kind of expansion the state's needs demanded.

Another thread running through the decade, with the emphasis allowed by salary legislation, was the improvement of the overall academic structure by Provost Tippo, particularly that accomplished in the College of Arts and Sciences with the assistance of Dean I. Moyer Hunsberger. Fiscal autonomy aided immeasurably in allowing these improvements, accomplished in a dynamic manner with a minimum of friction.

Faculty recruitment was given additional help in 1966 by Legislative passage of the Salary Relief Bill, strongly supported by both the University and the new Board of Higher Education. It provided for salaries outside the regular scale for approximately one percent of faculty and certain academic administrators, allowing for competitive hiring of a number of internationally known teacher-scholars.

Special emphasis was placed on two projects in 1966: acceleration of the expansion of the University's library resources, and further implementation of the residential college concept to combat the negative aspects of greatly increasing size. The same year, the first Associate Alumni Award for outstanding scholarship was presented, and academic programs under University auspices were inaugurated in England, Germany, and Italy.

A major restructuring of Student Personnel Services was accomplished at Amherst in 1966–67, consolidating all student activities and residence hall programs under the new position of associate dean of students, and beginning a program involv-

and attended by mud and noise and confusion—can make us feel that we are dedicated to pandemonium rather than to this high aim. But it is precisely when we experience all this stress and agony of accelerated growth that we must be all the more aware of the centrality of the individual in what we are striving to do.” (1962)

“Respect for the individual is one of the hallmarks of a democratic society. Protection of the rights of the individual is essential, yet it is, I feel, a passive safeguard. I would hope the concern of society for individual dignity would be exhibited in a positive fashion as well. By this I mean providing the opportunity for the fullest development of the talents, skills and intelligence of each member of society. This is a very fundamental purpose of education. This is the reason, I believe, that American education is an inherent part of the democratic process.” (1963)

“We must always keep in mind that, despite the sheer numbers that will be involved in education, ultimately we are dealing with the individual student and his search for fulfillment as a human being.

“There is much pressure to measure the effectiveness of American education in terms of success in reaching the moon, in terms of techno-



Dr. Lederle, always a Redmen booster, stressed educational benefits of sports.

Students and legislators engaged in important dialogue on Legislators' Day 1970.



ing the counseling staff in selection and training of residence hall counselors. The University administration developed and refined its methods for dealing with student dissent.

Also established during the year were the College of Arts and Sciences Information and Advising Center (CASIAC), and a Center for International Agricultural Studies. Closed-circuit television use was improved in the School of Education, a Project Themis award opened interdisciplinary University work in deep-sea submersibles, and the Commonwealth Technical Resource Service (COMTECH) was established. Dr. Kenneth G. Picha was named Dean of the School of Engineering.

Two new overseas programs were initiated in 1967–68, in Spain by the University at Amherst and in France by the University of Massachusetts at Boston. A remote-access time-sharing computer program was begun at Amherst, and a new admissions program approved for students from disadvantaged backgrounds. The School of Education, undergoing a thorough reorganization under new Dean Dwight W. Allen, was selected as one of nine institutions in the nation to develop a model elementary teacher education program. Dr. Wendell R. Smith was named Dean of the School of Business Administration.

In 1968–69, the administration strengthened its urging that an annual growth factor be built into the operating budget, rather than face the prospect of cutting back on the 1500 new students per year quota set at Amherst. In an era of generally tight money, however, the Fiscal 1970 operating budget posted a decrease of \$18 per student, causing considerable retrenchment including a shortening of the successful Summer Session from 12 to six weeks' duration.

For the Medical School in Worcester, Federal fund applications totalling \$35 million were approved and sufficient state funds provided to allow construction of the medical science building and planning of the teaching hospital. In Boston, land acquisition was begun after acceptance of Columbia Point as a permanent site of a 15,000-student University of Massachusetts at Boston.

logical development, and in terms of the amount of money that graduates can make. But let us never forget that the real measure of our success for our educational system lies in its ability to develop individual initiative, self-reliance, and self-fulfillment in each student, regardless of race, creed, color or religion. That is the real test and the real measure of education." (1963)

"I don't profess to be a prophet, and yet I venture the opinion that our greatest challenge will be to produce, on the broadest possible scale, a modern form of the Classical Greek concept of the citizen—the enlightened, fully participating citizen. Combining within himself a spirit of continuing learning and a sense of active participation, such a person measures the value of his life and work in terms of an increment, in terms of intellectual attainments over and above those required for earning a paycheck and in terms of cumulative contributions to the near and far communities around him." (1963)

"As we begin studying Massachusetts education under the leadership of the Master Plan Study Commission appointed to this task, I would urge that the bedrock from which we start be quality, the highest possible quality, and not an unenlightened prudence and parsimony.

The New Boston Site — Columbia Point





Gov. Francis W. Sargent visits Dr. Lederle in latter's office.

Planned buildings of UM/Boston at Columbia Point, with Morrissey Boulevard at far left and Mt. Vernon Street at top, include 14 major structures on 90 acres, with a target of 1980. The 15,000-student facility is shown in architect's conception. Approximately 2,500 commuting students are envisaged at each of six interrelated "colleges."



The attempt to cut corners in this very serious business of education in the latter 20th century can bring us to disaster as far-reaching as any experienced in our history." (1962)

"Government, and its services, are not merely restrictive or police functions. I prefer to conceive of government as a means for cooperative action in those areas of life where individually or privately we are unable to cope effectively with major problems.

"The attitude that government is a negative and policing agency adversely affected the University when I first came here five years ago. Initiative to meet the truly horrendous educational challenges of the Sixties was blunted by the prevailing need to get clearance upon clearance from State House functionaries for practically every management decision. Bureaucrats were, in effect, by action or by inaction, making educational policy and operational decisions for which they were untrained and for which they were not generally held accountable by the public.

"Morale at the University was low under this deadening system. The cumbersome red-tape in which the University and other educational institutions were enmeshed was notorious. Recruitment of quality staff had come to a virtual standstill. And, I



Flanking Dr. Lederle at his retirement testimonial given by the General Court in the House Chambers in Boston are Maurice A. Donahue, Senate President, and David M. Bartley, Speaker of the House.



In Amherst, 125 culturally deprived students were enrolled under the new program of the Committee for the Collegiate Education of Black Students, supported by the Legislature, the Ford Foundation, and the University at Amherst's Student Senate.

Also in 1968–69, Dr. Lederle announced his intention to resign in June 1970. During the year several other resignations took place. Dr. Frank L. Boyden resigned the chairmanship of the Board of Trustees, Dean of Administration Redfern accepted the presidency of Keene State College in New Hampshire, and Dr. Hunsberger resigned as Dean of the College of Arts and Sciences. Dr. Ryan resigned as Chancellor of the University of Massachusetts at Boston and was succeeded by Dr. Francis L. Broderick. Dr. Moore resigned as Dean of the Graduate School, and the following February was named Chancellor of the Board of Higher Education. Dr. Marion Niederpreum resigned as Dean of the School of Home Economics, and was succeeded by Dr. Helen G. Canoyer.

In October 1969 the University Trustees approved a plan for system-wide reorganization, defining the relationships of the component parts and establishing a central administration separate from each campus. In February 1970, Provost Tippo was appointed Chancellor of the University at Amherst. Secretary McCartney and Treasurer Johnson were absorbed into the system-wide office as Dr. Wood was named the University's 16th president at the close of Fiscal 1970.

On balance, it was an unprecedented decade. Without furor or flamboyance, the University administration successfully rode the breaker of growing need for public higher education despite early post-sputnik reaction against the humanities, and later curtailment of Federal assistance combined with a groundswell known as the taxpayers' revolt. Despite it all, the growth in support for public higher education has been most impressive.

As the majority of University students continue to come from families whose incomes cannot cover the full cost of attending college, Massachusetts may view with pride the passage of ten years with no increase in tuition at the state University.

might add, so widespread was knowledge of this sorry situation that most of the letters which I received upon my appointment as President were commiserative rather than congratulatory.

"Fortunately, the Governor and General Court sensed the need for creating a more efficient method of managing our educational institutions. The need, basically, was to release energy and initiative to meet the educational crisis thrust upon us. The result was the Fiscal Autonomy Act of 1962.

"Red tape and restrictive regulations were replaced by vesting in the Board of Trustees authority commensurate with their responsibility. This does not mean a blank check was issued to the University. It means the University must justify every dollar it requests from the State and account fully for every dollar appropriated to it. The University is subject, and properly, to detailed audits and must render complete reports on its fiscal and management operations.

"But there is more to fiscal autonomy than requiring the University to justify its level of support and to assure legal accountability. The real importance of fiscal autonomy was to place responsibility for University management where it squarely belongs—in the hands of the Board of Trustees and its responsible administrators." (1965)

Report of the Treasurer

Summary of Operating Funds

Fiscal Year Ending June 30, 1970

Where the Operating Dollar Comes From . . . Amherst, Boston, Worcester

	Total Amount	Percent of Total
Funds from University Receipts:		
Tuition	\$ 4,275,216.06	3.96
Residence Halls	548,748.76	.51
Sales and Services	1,357,880.91	1.26
Total University Receipts	6,181,845.73	5.73
Net Funds From Taxpayers of the Commonwealth	55,004,473.39	50.98
Sub-Total	61,186,319.12	56.71
Federal Government	12,345,987.69	11.45
Student Activities	2,130,503.76	1.98
Student Aid Funds	225,264.75	.21
Student Loan Funds Notes Receivable	2,893,377.29	2.68
Gifts and Grants	4,474,523.27	4.15
Auxiliary Enterprises	20,730,893.40	19.21
Endowment Income	161,810.44	.15
Agency Funds	3,735,094.21	3.46
Total Funds Available	\$107,883,773.93	100.00

How It Is Spent . . . Amherst, Boston, Worcester

	Total Amount	Percent of Total
Instruction		
State Funds	\$ 29,554,927.36	31.63
Federal Funds	2,787,355.00	2.98
Gifts and Grants	466,558.91	.50
Total Instruction	32,808,841.27	35.11
Library	3,065,012.99	3.28
Research	7,084,475.49	7.58
Public Service		
Agricultural Extension	1,928,015.64	2.06
State Agricultural Control Services	468,670.48	.50
Operation of Plant and Space Rentals	11,419,830.75	12.22
Administration	4,524,852.49	4.84
Student Service	1,813,643.51	1.94
Scholarships	1,844,293.44	1.97
Student Loan Funds Notes Receivable	3,018,334.96	3.23
Student Activities	2,358,591.22	2.53
Auxiliary Enterprises	18,178,680.06	19.45
Agency and Miscellaneous	4,939,752.81	5.29
Total Funds Used	93,452,995.11	100.00
Balance Carried Forward (Restricted Funds*)	14,430,778.82	
Total Funds Used and Balances	\$107,883,773.93	

*Balances, restricted funds, beginning of report year, \$8,056,018.01



Board of Trustees

Organization of 1969 - 1970

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Treasurer

"There is a great tendency, I am afraid, to categorize educational experiences. Students, for instance, often speak of their education in terms of individual courses or teachers.

To me, a university education is the totality of four years of varied experiences. All learning is not in the classroom. Look at the variety of enriching experiences available in the residential colleges. The highlight of a day might be a brief visit to an art exhibit, an evening of relaxation listening to the University Symphony, or a furious debate in the Hatch on a moral or political issue. Each is educational in a different way. The opportunity to probe the mind of an exciting professor in a private conversation in his office can be extremely stimulating. What makes a professor tick? What is he like personally when separated from his notes in the lecture hall?

The disciplined mind of a halfback waiting behind his blockers until the last minute, the trenchant presentation of student senators pushing for a new program, a magazine editor editing copy and laying out pictures, are all educational experiences that are almost totally unaffected by what goes on in the classroom. A truly valuable educational experience may be simply learning to live harmoniously with others in a residence hall.

Our bright young students are all unique. They come from the cities and the farms, from Massachusetts, from other states and from overseas. Some are well-to-do; others have a tough time making ends meet. The point is that they rub off on one another. Each has something to contribute and something to receive from his daily contacts. When we share our ideals, beliefs, knowledge and experiences through books, professors, classrooms, residence halls, or extracurricular activities in a balanced way, we are participating fully in education and developing our individual personalities into The Whole Man."

JOHN W. LIDEBLE

1968

APR 1971

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